MINING WORLD





September 1960 HOW PHILEX block caves helow this pit FLOAT GOLD — depress arsenic at Marietta FAMED Shinkolobwe U₃O₈ mine worked out ▶ 31

▶ 38

▶ 46



INCO readies its "recovery force"

International Nickel Company, whose giant new nickel-producing facilities at Thompson, Manitoba will make the world 75-million pounds-peryear richer when in full operation, has installed a formidable force of 139-66" Wemco-Fagergren Flotation cells for maximum recovery of mineral values.

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WEMCO

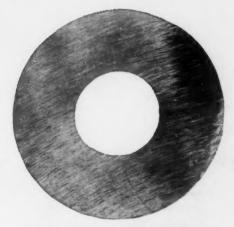
a division of

Western Machinery Company 650 Fifth Street, San Francisco 7, California

and throughout the world



Cross section of average extension steel, showing distorted center hole.



Cross section of Sandvik Coromant Steel, showing perfectly uniform center hole.

See for yourself why Coromant Steels last longer on the job!





The completely unretouched photographs above show clearly why Sandvik Coromant large-diameter extension rods last longer! Since Sandvik takes the time—and the trouble—to cold-roll these alloy drill rods, the flushing hole is uniform all the way through—smooth as a gun barrel. And, since the hole is even and perfectly round, you set up fewer strains and stresses in use…there's less whipping…and therefore, less breakage. And, with mechanically stronger rods, we can provide larger flushing holes for faster, more complete removal of cuttings.

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VOL. 22 No. 10

September 1960

New Equipment for today's mill flowsheet includes crusher automation and control, the new D'ore grinding mill, and electrostatic separation equipment 42

Iron Ranges 59	Northwest 64
Rocky Mountain 60	International 69
DEPARTMENTS	
Drifts and Crosscuts 5	Production Equipment
Capitol Concentrates 7	Preview
Metal and Mineral Prices 47	Coming Conventions 81



MILLER FREEMAN PUBLICATIONS

Advertiser's Index 86



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in aggregates...

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Send for Air Separator Bulletin No. 087.

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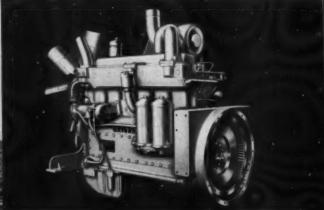
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Uranium Serves Man

There's good news for the uranium miner in the new publication of the United States Atomic Energy Commission—Community Impact of Peaceful Applications of Atomic Energy

Good news in that uranium (atomic energy) use has reached substantial proportions and these peaceful applications are increasing. Good news, too, that new uses are being found daily. With the present over-supply of uranium any report on increased consumption is of vital interest to the miner.

So, the statement in the publication, "Current thinking is that nuclear power may be economically feasible in five to ten years in some areas of the United States," and the Commission's report that, "The 10-year view represents the preponderant opinion at this stage," is optimistic.

Today and every day other atomic energy applications increase. While they don't use as much uranium source material as reactors they are most important to mankind. There now are several thousand licensed users of nuclear materials in some 1,500 cities and towns. About half the licenses are industrial; the remainder are medical, research, and education. Industrial uses in mining and metallurgy now include density gauges, flotation studies, pulp level indicators, determining pipe wall thicknesses, testing large castings, and many more.

Thus the uranium demand grows.

The John Scott Award

The MINING WORLD editorial staff has received the plaudits of the mining industry for honoring the most important companies, technical achievements, and engineers for their annual contributions to the mineral sciences.

It is always a distinct pleasure to see the award winners subsequently receive other awards from societies, governments, and companies. MINING WORLD feels that it has played an important part in their careers.

The mining industry now extends congratulations to Professor Frank A. Forward for receiving the John Scott award for 1960. Mr. Forward, head of the Department of Mining and Metallurgy at the University of British Columbia, was honored by MINING WORLD for making the Technical Achievement of 1960—direct leaching of zinc sulphides at low pressure and temperatures.

Professor Forward receives \$1,000 in cash, a medal, and a scroll from the estate of Scottish chemist, John Scott, who established a trust in 1816 in Philadelphia, Pennsylvania to honor inventors who benefit mankind.

JOY HAS THE RIGHT SLUSHER FOR THE JOB



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Three larger units in the "C" series go up to 75 hp for the heavy-duty jobs where portability is still required. For the largest semi-permanent installations, Joy builds large capacity slushers from 100 to 150 horsepower.

With more than 300 types and sizes of hoists and slushers to choose from, there is not a scraping job that can't be handled most efficiently with a Joy unit. Call in a Joy engineer for the size and type to suit your scraping jobs or write for bulletin 950-8.



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GOVERNMENT ACTION AND REACTION AFFECTING MINING



Lead-Zinc Producers Await Congressional Action . . .

Members of the lead and zinc industry had to mark time during the congressional recess, waiting to learn the outcome of their fight for assistance legislation.

Before the Senate is a House-passed measure (H.R. 8860) which authorizes stabilization payments to make up the difference between the market price and a price of 17.0 cents per pound for lead and 14.5 cents per pound for zinc. It applies only to small domestic producers, those producing or selling up to 2,000 tons of lead and/or 2,000 tons of zinc annually. Offered by Representative Edmondson of Oklahoma, the bill was passed in the House by the narrow margin of 197 to 191.

Consideration of the Edmondson bill by the Senate before the recess was delayed when Senator Allott of Colorado offered an amendment to make the assistance applicable to all producers of lead and zinc—not just the smaller ones—and to lower the applicable tonnage to 2,000 tons combined lead and zinc. He contended that the bill would stimulate produc-

tion and tend to weaken prices, and his amendment would compensate larger producers for those lower prices. He also proposed that the price cut-offs be reduced to 13.5 cents for zinc to 15.5 cents for lead.

Also awaiting action by the Senate is a measure for sliding-scale tariffs for both metals. These tariff provisions are incorporated in a rider added to a House-passed revenue bill (H. R. 5547) for the Virgin Islands. The rider, introduced by Senator Kerr of Oklahoma, provides for imposition of a 2.0 cent duty for lead which would be increased to 3.0 cents whenever the lead quotation is under 13.5 cents a pound. The additional 1.0 cent would be removed whenever the price of lead reaches 14.5 cents a pound. For zinc, the Kerr amendment provides a duty of 1.5 cents plus another 1.0 cent when the zinc price drops under 12.5 cents a pound. The additional 1.0-cent tariff would be removed when the price goes over 13.5 cents a pound.

The House Ways and Means Committee has approved a request by Representative Baker of Tennessee to have the Kerr provisions substituted for his own mill (H. R. 11,584) previously submitted on lead and zinc tariffs. The Baker bill originally implemented the recommendations made by the minority members of the Tariff Commission on March 31.

The Emergency Lead-Zinc Committee has taken the position that the Kerr bill does not provide adequate duties to protect the domestic miners, particularly the western miners, but it does include acceptance of the principles of a removable tax and perilpoint prices. The committee also realizes the fact that the Administration is opposed to the proposal, and that if the bill should reach the President, a veto is very possible.

Concerning the small-mine subsidy bill (H. R. 8860), ELZ committee comments that the opinion seems to be that if the Senate accepts the Allott amendments, the bill will be killed. Other than the amendment problem, the committee feels that Senate passage appears feasible.

Stockpile Formula Needs Re-Study As Cuba Defects . . .

The government has sold approximately \$1,600,000,000 worth of material from the national stockpiles as surplus to our war needs. The Pentagon, in collaboration with the Office

of Civil and Defense Mobilization, some time ago cut the estimated war period in the so-called stockpile formula from five to three years. The formula included Cuba, Canada and Mexico as a part of the mobilization base when figuring accessible materials in calculating the probable stockpile needs. Cuba now has defected and there are anti-American riots in Mexico. Perhaps OCDM should take another look at its formula.

Court Rules In Favor of Miner On Power Site Claims . . .

A Federal District Court in California ruled recently that the owner of mining claims located on land later withdrawn for power purposes did not forfeit his claims when he failed to file a record of them in the United States district land office within one year after August 11, 1955, as required by the Mining Claims Restoration Act of 1955.

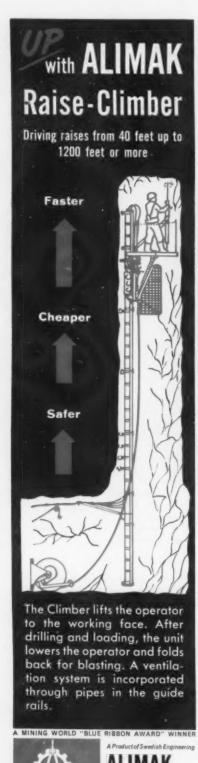
This act, while requiring such filing, provides no penalty for failure to do so and further provides that nothing in the act "shall be construed to limit or restrict the rights of the owner or owners of any valid mining claim located prior to the date of withdrawal or reservation."

In an opinion dated October 29, 1957, the Solicitor of the Interior Department declared, "Failure to file as required results in a forfeiture of the claim." As a result of this opinion, Bureau of Land Management officials began to send notices to owners of claims who had not filed, informing

them that their claims were forfeited.

In this particular case, no notice was sent the claimholder, but BLM officials maintained that they legally could send the notice at any time. The claimholder then brought suit to procure an injunction restraining these officials from issuing any notice declaring his mining claims forfeited, or clouding his title. The court granted summary judgment in his favor.

In his memorandum, Judge Sherrill Halbert concluded: "The solicitor takes the position that the act would prevent the restriction or limitation of



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claims, such as plaintiff's, but would not preclude their complete destruction. It is completely unrealistic to assume that Congress would exert itself to avoid limitation or restriction of such claims, and at the same time be quite willing to permit them to be destroyed entirely. A prohibition of limitation or restriction carries an implied prohibition of destruction. To destroy a legal right is to limit it to the smallest possible compass. It is in fact the greatest possible restriction. To declare plaintiff's claim forfeited would clearly violate the plain mandate of Congress."

Appeals Court Rules To Uphold Tariff Commission . . .

The United States Court of Customs and Patent Appeals recently upheld a lower court decision that in cases where the United States Tariff Commission makes specific recommendations the President must either accept them in toto or reject them.

The decision was given in the famous English bicycle import case, where excessive imports, in the opinion of the commission, were damaging to United States industry. The court used some hard words in censuring the President for making his own rules and setting various quotas or tariff rates to suit himself, regardless of the Tariff Commission's recommendations. The whole situation always has seemed a little silly as the studies of the commission and its recommendations have been modified by the President's economic and foreign advisers, and the enormous expense to the commission and industry in making studies and holding hearings, some of which have cost industry around \$250,000, actually were futile.

The President also has used other dodges to put off a decision. Although

the law says that he must decide on a course of action within 60 days of receiving the recommendations, he frequently has returned the report for "restudy" and, apparently, this can be done any number of times. Having to either accept or reject takes any other option away from the executive branch of the government. The decision would affect escape-clause recommendations on lead, zinc, stainless teel flatware and, perhaps, other items, as well as future "escape-clause" cases.

According to the recent ruling of the Court of Customs and Patent Appeals, the Congress had no intention of giving the President the authority it delegated to the United States Tariff Commission. This body, although its members are appointed by the President, is (like the General Accounting Office) actually an arm of the Congress. There is no question but that the government will carry the case to the Supreme Court, so the real outcome still is in doubt. The present decision, however, is encouraging to injured domestic industries.

Tungsten Carbide Is On CCC Barter List . . .

The national stockpile target for tungsten was supposed to be met and even exceeded a long time ago and for some time the government has talked about converting stockpile materials to usable form. Now the Commodity Credit Corporation announces, with the approval of the Office of Civil and Defense Mobilization, that it will enter into agricultural barter contracts

"in friendly foreign countries" for more than a million pounds of tungsten carbide powder.

In 1958 there were less than 200 workers left in the domestic tungsten mines—in 1955 there had been over 4,000. Also, the conversion program would put a lot of people to work. But who seems to care excepting the unemployed tungsten miners?

Revised Wilderness Bill Introduced . . .

A revised bill to establish a National Wilderness Preservation System was introduced by Senator Murray of Montana just before Congress recessed. The Murray measure (S. 3809) generally bans any form of commercial enterprise within the wilderness system. Prospecting and mining, and exploration for and production of oil and gas, would be permitted only in exceptional circumstances as determined by the President and under such regulations as

he may deem desirable. The wilderness system would be composed in part of millions of acres of national forest lands now open to prospecting and mining under the general mining laws.

Advocates of the wilderness legislation admit there is little chance that Congress will enact a wilderness bill during the special session. They have served notice, however, that they plan for an all-out fight for a "meaningful wilderness bill" next year.

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RON WORKS CO.



SPHALERITE

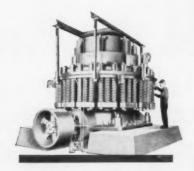
the "deceitful" ore of useful and ornamental ZINC

Zinc, from the ore *sphalerite*, is a metal of great economic importance. In the automotive industry alone, the increasing decorative and functional use of zinc die castings for grilles, instrument cluster housings, dash panel bases, door handles, etc., demonstrate the ore's economic value. It has long been used for galvanizing, brass making, and zinc-white pigments.

From earliest times, sphalerite has been known as the "treacherous" or "deceiving" ore. There is no other mineral whose appearance varies so much and which is so difficult to recognize on sight. It resembles galena but yields no lead. It is often host of many rare elements such as gallium or cadmium as well as many common minerals. Black sphalerite may contain as much as 18% iron.

This "deceitful" mineral and other zinc ores are efficiently and economically reduced by Symons Cone Crushers to the fine, uniform size necessary for further processing. As in all important ore and mineral operations throughout the world, Symons Cone Crushers are first choice of leading producers for high capacity production at low cost.

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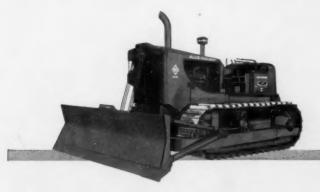
TOUGH TOOLS MATCH TOUGH JOB POWER

Allis-Chalmers rear-mounted rippers maintain most effective penetration angle at all depths...up front, specially designed bulldozers make most of HD-21's tremendous power.

Modern tractor power, plus modern ripper and dozer design, is making a big difference on today's tough jobs. With the HD-21 and ripper, for instance, up to 60,000 pounds of drawbar pull let you rip 'n' doze what you once shot and shoveled . . . puts one man, one modern machine in place of a typical 4-man blasting operation.

Allis-Chalmers leads the field in making rippers practical and effective for these tough jobs. The introduction of parallelogram design — unique Allis-Chalmers feature on these big HD-21 rippers — keeps shanks at most effective penetration angle at all depths. You get the same effective tooth angle ... up ... halfway down ... or working a full two feet deep!

In addition, Allis-Chalmers dozer design utilizes the latest developments in steel to produce durability which makes the most of today's big tractor power without profit-killing maintenance and repair. Trunnions, "C" frames, struts and moldboards match the HD-21's brute strength. If you're bidding or working any tough materials, your Allis-Chalmers dealer will furnish all the facts on successful ripper/dozer application. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



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"Live track' power steering rock...SO WE KEEP OUR TD-25

-Asheville Contracting Company,

Shale and blue granite rock make up 85% of the 550,000-cu. yd. of roadway excavation on this contract -5.18 miles of Blue Ridge Parkway construction, for the United States Department of Interior.

That's why Asheville Contracting Company places maximum reliance on their "rock-movers' special": king-sized International crawler power! Where the going's too tough or job progress is too slow and costly with big clutch-steered crawlers, "Asheville's" new 230-hp TD-25 and two veteran TD-24's take over—and "run interference."

"International 'live track' power steering moves more dirt and rock," states M. H. Reighard, Superintendent of rock operations for "Asheville." "Therefore, we keep our TD-25 and TD-24's on trail-blazing and pioneering. The 'live track' feature keeps the blade in the material and makes steep work safer. TD-25 balance enables working 'almost straight up' on mountainous terrain."

Exclusive, years'-proved International Planet Powersteering gives you full-time live power on both tracks to handle full loads on turns as well as straightaways. Load-limiting "dead-track drag" is eliminated. And



moves more Pioneering"

Asheville, No. Carolina

"live track" power-steering is combined with on-the-go, Hi-Lo power-shifting that lets you match power to load instantly, for full-speed cycles. You do away with timewasting "gear-shift lag!"

New TD-25 seven-roller tracks are strength-matched to the full effort of the high-torque, 230-hp turbocharged Diesel engine! The "25" is platformed on shock-resistant, double-box-beam track frames—smoothly carried on International's dual-protected Dura-Rollers, the track rollers that make 1,000-hr. lube intervals practical!



As standard equipment at no extra cost, the TD-25 gives you exclusive, combined Planet Power-steering and Hi-Lo on-the-go power-shifting. And you get this work-speeding design advantage in torque-converter or direct drive model. Here, Asheville's "25" operator is ready to "shift-up" to keep the load on the move.



Power-steer and power-shift the TD-25 with king-sized loads—around curves, upgrade, anywhere! Compare planet-powered "25" ability to deliver full-load capacity, full-time—to outearn other big rigs up to 50%—blading rock, benching, push-loading, mass-production dozing (where fast reverse and decelerator action count), ripping shale! Let your International Construction Equipment Distributor demonstrate!

Even with an enormous offset load of shot-rock there's no "bank-nosing;" no sluing. The TD-25 operator simply operates the load-side track in high-speed range—the other track in low-speed range. Result: full-capacity, straight-ahead performance—the same as the "25" gives on benching, bank-cutting, or side-casting!

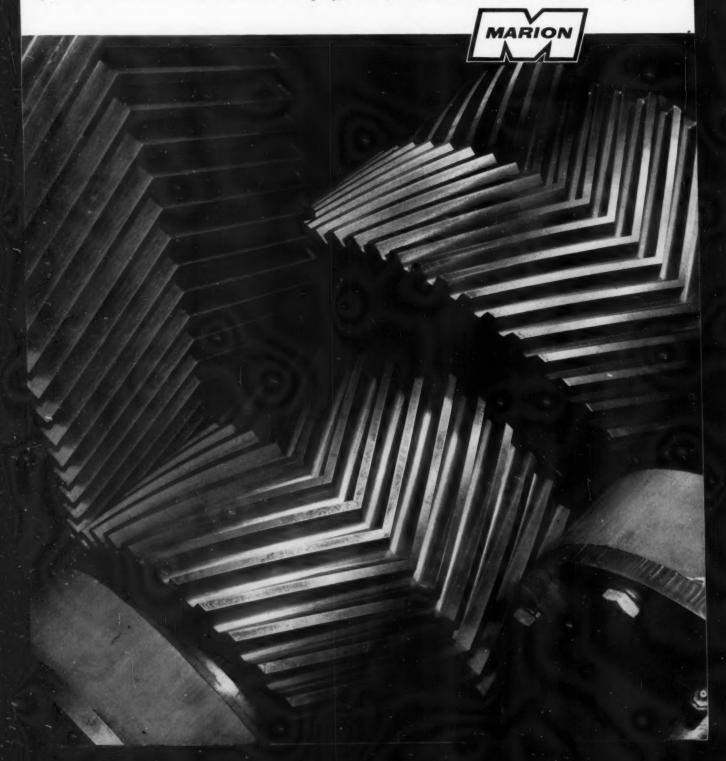
Heavy-duty TD-25 Dura-Rollers feature thick, deflectionproof shells; full-floating, precision fitted seals; king-sized lube reservoirs; and exclusive pressurerelief passages that protect seals from overlubrication. These minimum-maintenance track rollers give you practical 1,000-hr lubrication intervals!





International®
Construction
Equipment

International Harvester Co., 180 North Michigan Avo., Chicago 1, III. A COMPLETE POWER PACKAGE THIS IS MARION QUALITY Excavator manufacturers don't have to use herringbone gears. Some do. One of them is Marion. It boils down to just how literal a manufacturer is trying to be when he says "our machines have longer life." Marion knows, and so do discerning big-machine owners, that the unique design of herringbone gears does mean longer life in the truest sense. Smoother power flow too, with less vibration. More metal is in constant shear which means the unit is delivering total power at all times. Yes, it takes more machining operations to produce them. Yes, they're more expensive. But dollar for dollar, over the life of a Marion, such significant improvements as herringbone gears give you value received "plus." Just one more example of Marion quality in action for the big mining and quarrying jobs of the Sixties. Marion Power Shovel Company, Marion, Ohio, a Division of Universal Marion Corporation.



On drifters, sinkers, and stopers...



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Another reason why more people use Timken bits than any other removable rock bit is the service they get from Timken Company field engineers—the kind of service you can't get anywhere else. For more hole-per-bit on drifters, sinkers and stopers, use Timken bits. They're available in a complete range of bit sizes and types. Get the full details in a free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

Call on us at the AMC Metal Mining Show, Las Vegas Convention Center, October 10-13, Booth 318. FOR OTHER TOUGH DRILLING JOBS



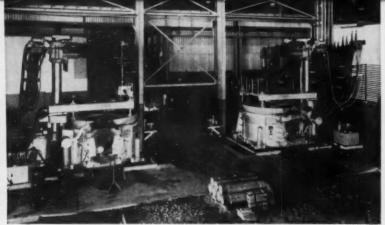
Timken all-steel multi-use bit, with correct, controlled reconditioning, gives you lowest cost per foot of hole when you can drill out full increments of steel.



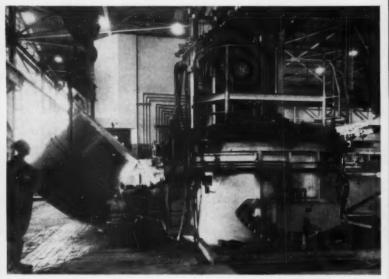
Timken tapered socket carbide insert bit, the "TTC", is removable for full steel life, tapered for more secure union. Has same frontal features as threaded bit. Gives you bit removability with one-piece strength.



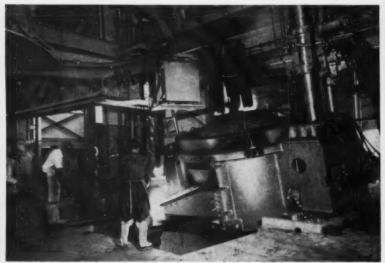




Two Lectromelt cold-melt batch furnaces melt gray iron.



Molten metal is transferred to Lectromelt duplexing furnace through special duck-bill receiving spout.



Duplexing furnace is tapped into ladles which are conveyed to pouring floor.

Lectromelt furnaces in action

at Sao Paulo foundry

Efficiency keynotes the layout of Lectromelt furnaces at this South American gray iron foundry. The two Lectromelt 5000-KVA cold-melt furnaces have fast charging, raise-andswing roofs and superstructures. Each melts and taps in excess of 9 tons of iron in 11/2 hours. The duplexing furnace, designed for fast handling of molten metal, superheats and adjusts the analysis of more than 20 tons of iron per hour.

For productivity in your melting, contact Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pa.

WHEN YOU MELT... Lectromelt





For a better profit picture... CHECK EUCLID C-6 WORK-ABILITY



You'll find this new C-6 has the all-around tractor versatility needed for heavy construction, mine and quarry work. With five years of rugged field and proving ground test, this new crawler sets higher standards of performance on the toughest jobs for tractors in the 200 h.p. class.

Here are just a few advantages you get in the C-6...a dependable GM 6-71 engine delivering 211 net h.p. to the power train...a proven Torqmatic Drive that provides full-power shift and cuts cycle time...fast-as-a-fox maneuverability...almost unbelieveable ease of handling...accessibility for servicing that pays off in more productive time on the job. It responds like nothing you've ever touched!

Have your Euclid dealer give you all the facts on the C-6...he'll show you why this new "Euc" belongs in your spread...why it's your best equipment investment.

EUCLID Division of General Motors . Cleveland 17, Ohio



EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

San Juan de Lucanas

reversed an orthodox flow scheme to cut cost-plus-tails on silver-lead ore!

Textbook metallurgy does not necessarily produce the lowest cost-plustails. San Juan de Lucanas experience demonstrates that.

High in the Andes some 400 miles S. E. of Lima on an Indian trail to ancient Inca workings, this mill treats 300 m.t.p.d. of a siliceous ore containing 4.72 gms. Au; 21.06 oz. Ag and 0.66% Pb per metric ton. Silver occurs mostly as argentite with some proustite and miargyrite. There are also small amounts of sphalerite and pyrite associated with galena.

At San Juan de Lucanas, cyanidation followed by base-metal flotation did not produce desired metallurgy. But tests at Cyanamid's Mining Chemicals Laboratories and on the mill revealed that reversing the flow scheme would be both practical and profitable.

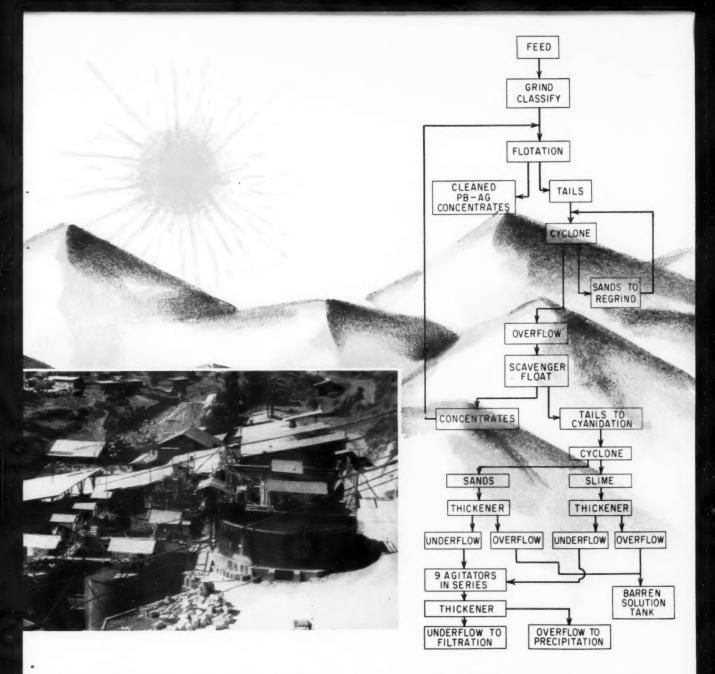
Accordingly, mill feed is ground 55% minus 200 mesh in the presence of 0.19 lb/ton Sodium Cyanide and 0.22 lb/ton zinc sulphate. This reagent combination effectively depresses pyrite and sphalerite while amyl xanthate floats galena and associated silver. pH of the flotation circuit is 7.5. High precious and base metal recovery by flotation in the presence of quantities of cyanide is somewhat unique.

Flotation tails are cyanided with AERO® Brand Cyanide in nine agitators for approximately 52 hours. Recovery of precious metal values is excellent. Current reagent combinations and typical results are:

REAGENTS, Ib. per ton Cyanidation - 294 mtd. **AEROB Brand Cyanide** CaO 7.0 Flotation - 300 mtd. Zn dust Sadium Cyanide 0.19 Zinc Sulfate 0.22 Cyanide solution Amyl Xanthate 0.12 Start 0.202% NaCN equivalent 0.058% CaO Frother 0.025 Finish 0.179% NaCN equivalent 0.042% CaO

TYPICAL RESULTS

	Au	Ag	Pb	Re	covery	1 %
Product	gm/ton	oz ton	%	Au	Ag	Pb
Flat. Feed	4.72	21.06	0.66	100	100	100
Flot. Conc.	183.7	801.4	26.8	77.6	75.9	77.4
Flot. Tails	1.08	5.17	0.16	22.4	24.1	22.6
Cyan. Tails	0.01	2.02		0.7	9.4	



Users and prospective users of Cyanamid Reagents benefit by the composite mineral-dressing knowledge acquired by Cyanamid's Mining Chemicals Laboratories from all world mining fields and on every type of ore over the past 40 years. They benefit by the unbiased creative test-work of this Laboratory in de-

termining the right reagent combination for lowest cost-plus-tails and also by the practical in-the-mill help of Cyanamid Field Engineers. These extra values are an integral part of every shipment of Cyanamid Reagents . . . values which Cyanamid alone provides to customers and prospective customers.

AMERICAN CYANAMID COMPANY

EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

CYANAMID INTERNATIONAL — Mining Chemicals Department Cable Address: — Cyanamid. New York

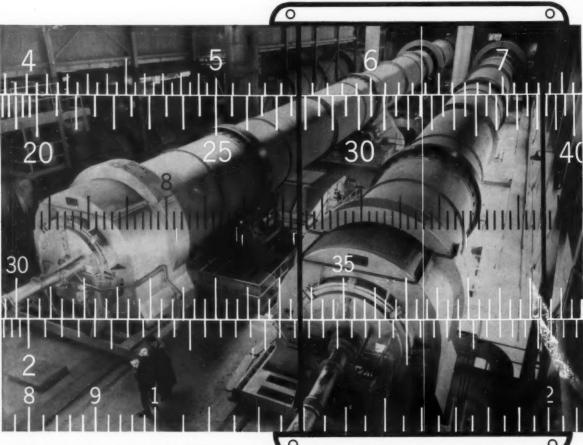
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from design through installation to operation



Visit Traylor Booth 211 at the Mining Show



Shown above are two* 11'-3" x 300' dry process Traylor kilns designed to meet the specific needs of the Lone Star Cement Plant in Nazareth, Pennsylvania. These modern rotary kilns feature full-floating type roller ring and roller supports which insure easy alignment, continuous operation and low maintenance costs. Traylor rotary kilns have all welded steel shells, feed and discharge end seals and improved kiln feed.

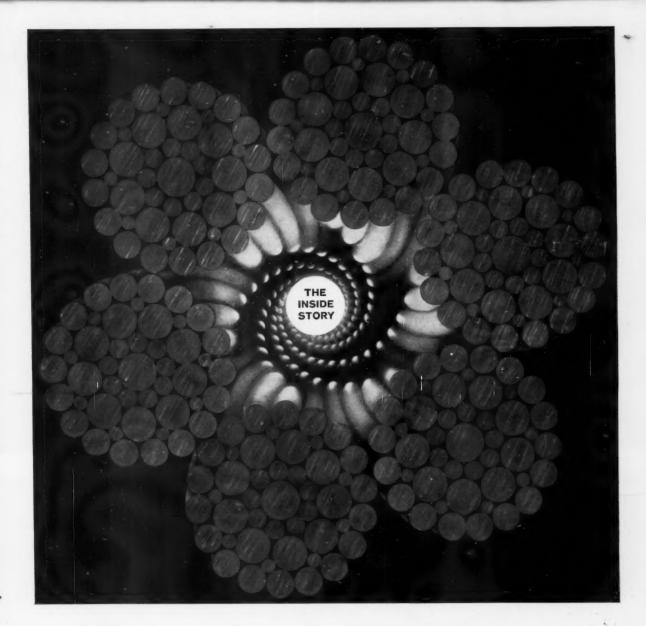
Write today outlining your kiln requirements and let our engineers make recommendations . . . or write for Bulletin No. 1115.

*Shown in the background are two additional Traylor Kilns, 11'-3" x 270'.

TRAYLOR ENGINEERING & MANUFACTURING DIVISION OF FULLER COMPANY

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ROYAL BLUE - we put a lot of work into it - You get a lot of work out of it.

ROEBLING ROYAL BLUE WIRE ROPE This is rather a long view of a wire rope that's a real work horse. Time and tests have taught us at Roebling that wire rope users *want* the long view. What else, they say, are they spending their money for?

Here, you're looking through a length of Royal Blue whose core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

This is one of the reasons why Royal Blue lives up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

We have to know that the rope we build will do what we sell it to do. Numerous quality-control measures help us—as they do you—to take the long view of Royal Blue. For details about long-lasting Roebling Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.



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More proof that ...

AMSCO HELPS YOU HANDLE MORE TONS PER DOLLAR

AMSCO PUMP OPERATES 24 HOURS A DAY...PUMPS DISCHARGE 3 MILES

On the dredge C. H. Cobb, operated by New England Dredge & Dock Co., the Amsco 12" Form 50 S3B pump shown at right is "on duty" 24 hours a day, 6 days a week. It handles 5000 yards a day, pumps discharge over 3 miles with one booster... under 23 railroad tracks, through a mile-long railroad tunnel and through cliffs to a marshland.

Regarding this Amsco pump, installed 2½ years ago, Mr. C. H. Cobb, General Superintendent says—"Its performance and price make this the most desirable pump on the market".



JAW PLATES REDESIGNED IN AMSCO ALLOY...TONNAGE UPPED 75%

At Star Rock Products Co., Anaheim, California, crusher jaw plates previously used were giving only about 6 months' service. Large rocks dropped into the crusher often caused the jaw plates to "give" enough so the rocks wouldn't crush. Jams and costly delays resulted. Plates would often flow and crack.

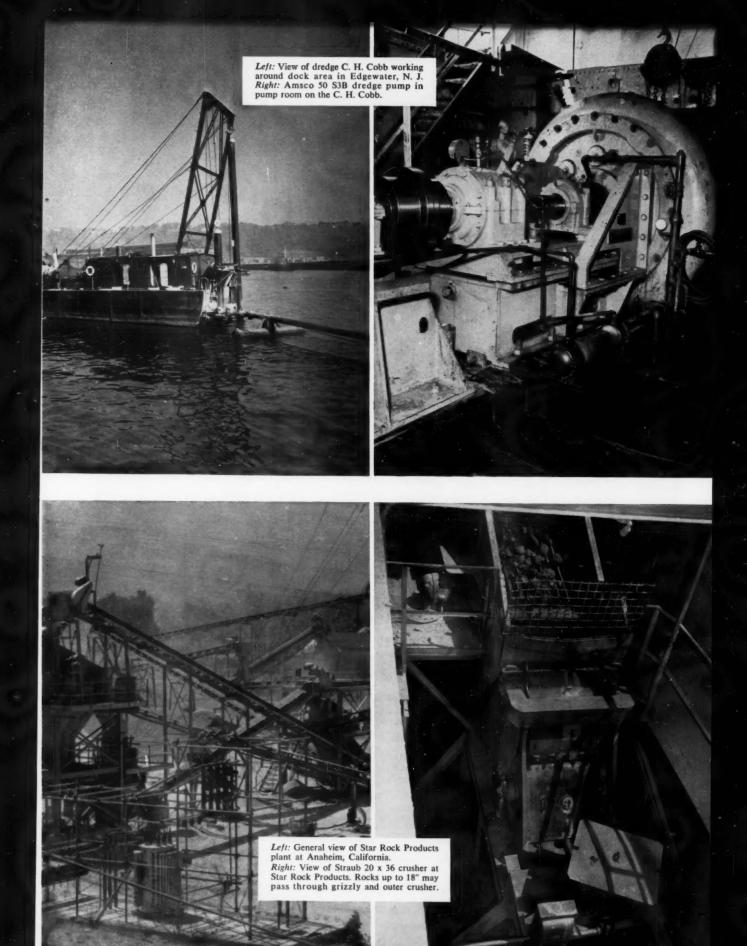
Amsco collaborated on a redesign, using 2% chrome (Amsco MY) alloy. After 6 months' service, the plates were in excellent condition. Jams and delays have been eliminated, and tonnage handled increased 75%.



American Manganese Steel Division • Chicago Heights, III.

Other plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis
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Lima Type 2400 6-cu. yd. shovel at work loading ore in Venezuela iron mine.

THE LIMA TYPE 2400... muscled for the big mining jobs

Quality does pay off. As hundreds of mining operators have found, Lima's extra engineering features and precision construction mean greater tonnages, higher profits.

When the going is tough, there is no substitute for these Lima Type 2400 quality features:

Crawlers are wide and long for generous ground contact and ease of handling.

Tread rollers have specially hardened rims to resist wear . . . have dirt seal rings and retainers.

Drums are extra wide, with large diameters . . , advantageous when operating as a dragline, crane or high-lift shovel, because of greater cable capacity.

Anti-friction bearings at all important bearing points, including the

Extra-large air-operated clutches respond instantly to the slightest movement of the controls, reducing operator fatigue.

Torque converter increases output, reduces shock loading, prevents engine stall, . . cushioned effect of drive lengthens cable life, lowers machinery maintenance. Standard on Type 2400,

All gears, smaller parts and shafts that are subjected to extra wear are flame or induction hardened for longer life.

There is a Lima for every kind of mining operation. Shovels 1/2 to 8 cu. yds., cranes to 140 tons and draglines variable. Get full details on these powered-for-profit machines from your nearby Lima distributor, or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



Lima Type 604 11/2-cu. yd. shovel and Lima Type 1201 3-cu. yd. shovel loading iron ore on Mesabi Iron Range.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

Cable Address LIMASHOVEL, Lima, Ohio, U.S.A.

LIMA Construction Equipment Division, Lima, Ohio BALDWIN · LIMA · HAMILTON





Proof from Jones & Laughlin!

Ni-Hard liners keep their contour after grinding better than 2 million tons of ore

Here's photographic proof from the Benson Mine, New York Ore Division of Jones & Laughlin Steel Corporation in upstate New York.

Ni-Hard liners keep their contour — resist abrasion — provide a slow, uniform wear rate — are good to the last V_A inch.

You could never tell by looking at them, but these Ni-Hard* nickel-chromiumiron alloy shell liners have been grinding iron ore for more than 2 years. With better than 2 million tons of ore behind them, they've still got plenty of tonnage left in them!

Used in J&L's ball mills and rod mills—at the feed end as well as the discharge end—these Ni-Hard liners are delivering superior abrasion and wear resistance. They're saving many thousands of hours of downtime, many thousands of dollars in repair and replacement.

Try a set of Ni-Hard liners and see for yourself how the abrasion and wear resistance of Ni-Hard can increase your tonnage, can lower your costs.

Our detailed 58-page booklet, "Engineering Properties and Applications of Ni-Hard" suggests many ways to put this versatile and long-lasting material to work profitably. Say the word and we'll be glad to send you a copy.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street McO New York 5, N. Y.

NI-HARD®

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

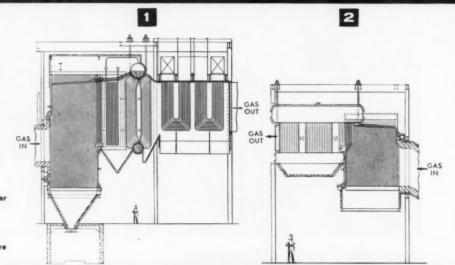
Effective Utilization of Waste Heat in Metallurgical Processing

CUSTOM-ENGINEERED BAW UNITS

Illustrated are 5 B&W Heat-Recovery Units, typical of many currently serving the metallurgical process industries. Complete data on application and modification of these and other units will be found in B&W Bulletin G-88, previously mentioned. Please write for your copy today. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

BAW WASTE HEAT RECOVERY UNITS FOR

- 1. Copper Reverberatory Furnaces
- 2. Refining Furnaces for Copper and other metals
- 3. Ore Roaster, Acid Plant or Kiln
- 4. Zinc Furning Furnaces
- 5. Heat Recovery with high temperature air heating and corrosion section



CONSIDERATIONS

The economic success of many metallurgical processes requires recovery of valuable heat and entrained product particles in waste gases.

In selecting or designing the best boiler for this important task, the following factors must be considered:

- Quantity of waste gas
- Gas temperature
- Gas pressure
- Chemical constituents of waste gas
- · Concentration of metallics and ash in waste gas
- · Size and abrasive characteristics of entrained material
- Fusion temperature of material carried in waste gas

Specific operating requirements further complicate the problem of heat and product-particle recovery. For a complete discussion of Waste-Heat Boilers and their application, write for B&W Bulletin G-88.

B&W DESIGN FEATURES

B&W heat-recovery and boiler-design specialists have years of practical experience in designing units for a wide variety of applications. Custom-engineered to meet specific process requirements, B&W Waste-Heat Boilers incorporate the following outstanding design features:

- Slagging problems are eliminated by cooling waste gases below the ash fusion temperature in water-cooled furnaces.
- Waste gas leakage and acid corrosion are eliminated by providing pressure casing. The casing temperature is maintained above the dew point of corrosive constituents in the gases. This inner casing permits operating up to seven inches w.g. gas pressure.
- Tube erosion by gas-borne material is eliminated and low-draft losses are obtained by

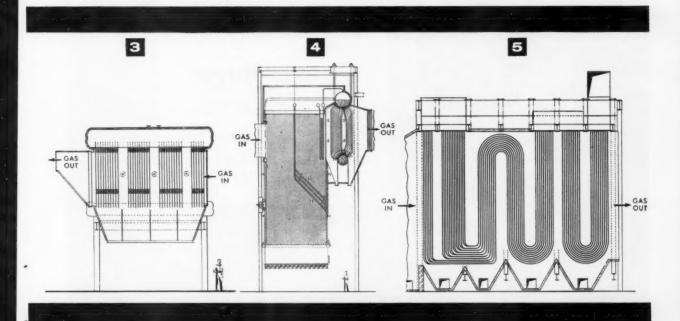
designing for low-gas velocities, with no gas baffles in the tube bank.

- In-line tube arrangements used throughout permit efficient tube bank cleaning by soot blowers, or hand lancing when appropriate.
- High-efficiency B&W Cyclone Steam Separators prevent solids carry-over in the steam, thus protect against superheater and turbine fouling difficulties.

 Complete visual observation of all heating surfaces is provided with ample, properly located doors and lance ports.

 Hoppers wth steep sloping sides and large outlet connections prevent material "hangup."

These built-in features assure continuous, trouble-free operation with low maintenance and high efficiency from every B&W Waste-Heat Boiler.



B&W Bulletin G-88

— "Effective Utilization of Waste Heat"

— on request.





THE BABCOCK & WILCOX COMPANY

BOILER DIVISION





New Projects Mean Major Expansion in World Mineral Output

A lead smelter in Africa; gypsum development in Newfoundland; zinc, chemicals, and steel activity in Morocco; increased phosphate production in Florida; trona expansion in Wyoming and greater potash output in New Mexico are latest additions to the list of multi-million dollar projects throughout the mining world today.

Tsumeb Corporation Ltd. will build the lead smelter and refinery at Tsumeb in South West Africa, adjacent to its copper smelter now under construction. The new facility will have a capacity of 80,000 to 90,000 tons of refined lead per year, plus facilities for recovery of silver, cadmium, and arsenic. It is scheduled for com-

pletion in mid-1963, while the copper smelter is to be ready in 1962.

Mining under Morocco's new Five-Year Plan will receive impetus with allocation of \$1,700,000 for development projects. A steel mill at Ras Kebdana; a zinc smelter in the eastern section of the country, and plans for producing triple phosphate and other chemicals are some of the projects scheduled.

Expansion of phosphate production in Florida will mean investment of more than \$30,000,000 to increase processing facilities of Virginia-Carolina Chemical Corporation, Tennesse-Corporation, American Cyanamid Company, Davison Chemical Company, Swift & Company, and other producers.

Rights to Newfoundland's gypsum reserves, estimated at 200,000,000 tons, have been acquired by Flintkote Company under a 99-year lease. The company will also build three plants in the United States.

Potash expansion by American Metal Climax involves a \$3,000,000 project in New Mexico and a \$7,000,000 plant in Mississippi.

The Green River, Wyoming, trona plant that Stauffer Chemical Company will build is the second trona project announced recently. Food Machinery & Chemical Corporation is increasing production at its plant in that area by 200,000 tons yearly.

Acoje Makes Fast Progress at Philippine Copper Prospect

Acoje Mining Company is rushing exploration at its manganese-copperzinc prospect in eastern Luzon, Philippine Islands. See MINING WORLD, August 1960, pages 28 and 29 for details of this new discovery.

Diamond drilling and surface trenching have been so favorable that the company has decided to name the operation the Sierra Madre Mine, after the range of mountains in which it is located and will use this as the place name. More than 160 surface trenches have now been dug and over 6,000 feet of diamond drilling. This exploration work has fairly well outlined over 200,000 tons of plus-40-percent manganese ore and several millions of tons of copper-zinc-gold ore. Manganese ore has been found in 135 of the shallow trenches; 26 of the first 27 diamond drill holes have cut copper-zinc mineralization. Recent assays for lead show one to three percent in the cores

although it is not apparent megascopically. Thin sections are now being made for microscopic study.

Survey crews are busy locating a road grade between the coast and the mine site which is 2,800 feet above sea level. Clearing and grading for the 3,000 foot long airstrip on the bank of the Dinapiqui River is being rushed, using tractors which were landed through the heavy surf with an LCT.

Kennecott Sinks Shaft to Develop Safford Copper Deposit

Kennecott Copper Corporation will start sinking a vertical two compartment shaft at its Safford, Arizona copper claims early in September. The new shaft will be for development purposes only as it will be too small for ore production.

The new shaft will be 800 feet deep with a station cut for development of one level, the 3900, about 50 feet above the bottom. From the station it is planned to drift and crosscut, and then diamond drill to gain further information about the very large mineralized area which covers several hundred acres and is known to extend to a depth of at least 2,000 feet.

Kennecott through its exploration

subsidiary—Bear Creek Mining Company—has been actively exploring the district for four years and in May 1959 purchased 120 mining claims for nearly \$4,000,000. The Lone Star Mines, Inc.'s claims were the key to this sale. Since the sale Kennecott has been doing "fill in" diamond drilling from the surface and has outlined 100,000,000 tons plus of less than 1.0 percent oxide copper. The new shaft will be the means of access to this deeply buried denosit.

Interestingly, the new shaft will be sunk not far from one of the first diamond drill holes drilled to depth in the area. That was done by Consolidated Coppermines in 1949.

The new shaft will be two-compartment with a minimum rock size of 11 feet 6 inches, by 7 feet 10 inches. The hoisting compartment will be 5 feet 6 inches square with a counterweight in the adjoining manway compartment. Kennecott will purchase all surface equipment which will include a steel headframe, 100 kilowatt GMC Diesel electric generating set, one Ingersoll Rand 600 cubic feet per minute gyroflow compressor, and one Vulcan Denver 90 horsepower single drum hoist.

The shaft will be sunk through a series of rhyolite and andesite flows which should make a total of less than 15 gallons of water per minute.

WHAT'S GOING ON in mining

International Hoists Its 50,000,000th Ton of Ore

As the 50,000,000th ton of ore was hoisted from the Carlsbad, New Mexico potash mine of International Minerals & Chemical Corporation, M. W. Kartchner, manager of mining operations, was right there to check the sylvite ore in the skip. He has supervised mining of all ore since production began in 1940. Original output rate since then has been increased ten times, now averaging 13,000 tons daily. Production has come from three levels—the 800 and 850-foot levels, which furnish langbeinite ore and the 900-foot levels where sylvite ore is mined. By combining products from the two ores, IMC has become a major producer of sulphate of potash, magnesium oxide, and hydrochloric acid.

Topaz Mountain Beryllium Found in Miocene Tuff

Recent announcements by Brush Beryllium Company of Cleveland, Ohio, and Beryllium Resources Inc. indicate promising beryllium deposits in the Topaz Mountains of Utah.

The beryllium in this area is found in altered ryholite tuff that forms a bed about 200 feet thick. Individual beryllium-bearing layers may be five to 20 feet thick. Continuity and tonnage of ore is not yet determined. The tuff is of Miocene age.

The ores are amenable to acid reduction and the two firms have discovered means of getting the beryllium values out of the acid solution. A series of other chemical steps can convert these values to a beryllium hydroxide.

Because of the metallurgical advances, exploration and development work is being accelerated in the district northwest of Delta, Utah.

Joint Studies Set by U. S. And Nevada Mines Bureau

Exploration and evaluation of industrial minerals in Nevada will be intenified through a cooperative agreement by the Nevada Bureau of Mines and the U. S. Bureau of Mines. An extension of existing cooperative arrangements, the agreement goes further in providing federal government assistance for laboratory testing industrial (non-metallic) minerals.

ing industrial (non-metallic) minerals.

The joint effort will make available to Nevada's mineral industry the Federal laboratories, equipment and trained personnel which the state could not afford to duplicate.

The program will stress the study of many minerals including, clays, shales, pozzolan cements, special sands, lime-stones and similar materials to determine their potential use in varied industries. The Nevada Bureau will be responsible for field reconnaissance, correlation of data, sampling, and delivery of samples



to the U. S. Bureau's Metallurgical Research Center in Reno, from where the samples will go to the proper facility for testing.

Nevada residents may submit samples to the state bureau, if these are accompanied by accurate data on location, size, and ownership of the deposits. If promising, samples will be examined by state bureau staff members and then tested at Federal facilities for plasticity, melting point, firing qualities, and other properties.

Cleveland-Cliffs Seeks Buried Missouri Iron Ore

A survey project in Washington County, Missouri, is being conducted by Missouri Cliffs, Inc. to locate additional iron ore deposits in the area. The exploration subsidiary of Cleveland-Cliffs Iron Company began its studies a year and a half ago with aerial magnetometer surveys, The company has reportedly taken up leases and options on several pieces of property in the county.

The project is headed by Don Adair, formerly with the Oglebay Norton Company in Duluth, Minnesota. Eric Rexinitiated the program for the firm in 1959.

Reserve's Taconite Expansion Will Cost \$120,000,000

The current expansion of Reserve Mining Company's taconite facilities ranks in importance with discovery of the Mesabi range, according to Dr. E. W. Davis, retired University of Minnesota School of Mines director who pioneered modern taconite processing. The program, says Dr. Davis, who is a Reserve consultant, indicates iron ore can be made as cheaply from taconite as from Labrador iron ore.

The expansion, which will increase Reserve's capacity by 60 percent, permits production of 9,000,000 tons annually. Scheduled for completion in 1963, it may

involve further development of townsites of Babbit and Silver Bay, Minnesota. Employment will probably increase to 3,000 from the present 2,200. According to R. J. Linney, Reserve's executive vice president, the firm is experimenting on a major step which can contribute greatly to expansion of taconite and to conservation of all Minnesota taconite reserves. The company has asked for authority to double its present usage of Lake Superior water.

Phases included in the expansion program are: construction of a second coarse crusher section at the Babbitt mine site; doubling the repair and maintenance buildings at Babbitt; acquisition of additional mobile equipment such as jet piercers, shovels, Diesel locomotives and railroad cars; building a second railroad track to parallel the present 47 miles of trackage from the mine to the concentrator; installation of a second car dumper at Silver Bay; expansion of fine crushing, concentrating, and pelletizing sections at Silver Bay, and enlarging the boat loading equipment and pellet stockpiling area.

Stauffer Chemical Plans Soda Ash Plant in Wyoming

Stauffer Chemical Company will double its output of soda ash with construction of a plant near Green River, Wyoming. Initial capacity of the refinery will be 150,000 to 200,000 tons annually. Stauffer currently produces soda ash at Searles Lake, California.

Production at the new plant, scheduled for completion late in 1962, will be based on the company's extensive, high-grade trona deposit where a drilling program has been underway for two years. The trona beds will be developed by sinking two 1,000-foot shafts, one for production and one for ventilation. The project also includes construction of a railroad bridge across the Green River; a railroad spur, highway and a refinery.

The trona as mined contains some shale

The trona as mined contains some shale and carbonaceous material but Stauffer has developed a process to refine the ore to yield top quality soda ash.

Potash Expansion Planned For Carlsbad, New Mexico

A \$3,000,000 expansion of Southwest Potash Corporation's potash facilities in Carlsbad, New Mexico has been announced by American Metal Climax, Inc. This increase in production capacity will be the second one made by the firm since its mine and mill went into operation late in 1952.

The new facilities will also provide for further improvement of the firm's muriate product to meet increasing fertilizer sales.

A \$7,000,000 plant, to be built at Vicksburg, Mississippi, will use a new process for producing nitrate of potash at fertilizer prices. Chlorine will be produced as a co-product. The plant is scheduled to come into production in October 1961.

Block caving

highly fractured copper-gold ore body in the Philippines

From prospect to a 2,000-ton-per-day mining and milling operation in four years is the proud record of Philex Mining Company at its Santo Tomas II copper-gold mine near Baguio, Mountain Province, Philippine Islands. While this may sound like a long time, remember that Philex started with nothing but a few small exploration tunnels on a very steep mountain side at the end of a jungle trail. All equipment and gasoline for the first 20,000 feet of diamond drilling was carried to the mine site on men's backs. Ten miles of new road through rough mountains were built and eight miles of trail widened for trucks before the first piece of equipment or supplies could be transported to the mine.

Breaking of ground for the mill foundations started in September 1957; first ore was milled on July 5, 1958; and the 1,000,000th ton was milled on May 31, 1960. Open pitting produced 800,000 tons, and underground block caving 200,000.

Philex was formed in 1955 primarily as an exploration and mine evaluation organization. Among other prospects, the pre-war work at this particular property was remembered by George T. Scholey, general manager. He ordered a close examination and diamond drilling commenced in late 1955. It was finished around the end of 1956. Assay results from these holes, the old drifts and crosscuts, and several new crosscuts, were evaluated to outline a large low grade copper-gold ore body.

Ore reserves were estimated on January 1, 1960, at 21,930,000 short tons assaying 0.81 percent copper and 0.03 ounce gold per ton. Current diamond drilling has indicated ore extensions of similar grade on the west end and a greater depth.

Most of the ore was found to be in a highly shattered zone of andesite alongside a large tongue of blocky diorite. Relatively high values were found along the contact for a strike length of about 800 feet. These high values formed a zone about 250 feet wide north of the contact and of indeterminate depth. Lower values are found in a halo around this core. Although delineation of the ore body

is used for low-cost mining of

by George A. Scholey . . .



With his father, George T. Scholey (right), at the head of the crushing plant at Philex. George A. is mining consultant for the company and his father is general manager. George T. has been actively finding and developing copper mines in the Philippines for 30 years. In this article, George A. describes how father and son have most successfully introduced block caving to the Islands.

was not complete, enough was developed to warrant the construction of a 2000-ton-per-day flotation concentrator and mine plant.

The highly shattered mineral bearing andesite and even the less fractured diorite indicated that the ore body was amenable to block cave mining. Open pitting was considered, and evaluated. However, the amount of stripping necessary to completely expose the ore body properly was considered prohibitive.

The location of the ore body above the mill site eliminated the need for a hoisting shaft or equivalent for quite some time. This enhanced the attractiveness of a caving operation. However, open pitting had the advantage of quicker entry into a section of the ore body exposed on the surface than did the block-cave method at greater depth. Therefore, the decision was made to get production started fast from an open pit. The pit was to maintain full production for about a year until the block caving began, and then production tapered off as more blocks were caved. Pit production was to be limited to



IN THIS REPORT ...

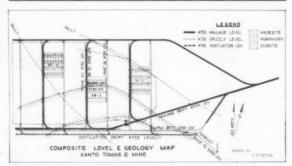
Selecting caving system . . ▶ 32 Develop and cave first block ▶ 34

Planning block size ▶ 32 Lessons from caving ▶ 34

Haulage and drainage . . . ▶ 34 Changes for second block ▶ 35

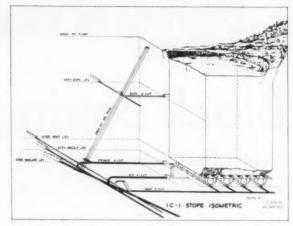
PHILEX'S BLOCK CAVING

. . . continued from page 31



obtaining quick ore from several small ridges which required a minimum of stripping. However, pitting has since been expanded due to delayed underground development.

Long before the road was completed to the pit area, we decided to develop a small test block off one of the old exploration crosscuts in order to get a rough idea of



the caving characteristics of the ore. A small 40 by 60 foot block with a 100-foot back of ore was inexpensively developed and undercut in February 1958. Undercutting and the first phase of caving were successful. For six weeks three men drew and hand-trimmed 50 tons per day out of this block. The back finally arched over and caving ceased. Although not successful as a caving block, much

Three caving systems evaluated with respect to local conditions

In planning the mine there were three basic types of caving to choose from. The first was a full gravity system using many ore transfer raises and branch raises under the blocks. Although this has been the basic system used successfully and safely for many years in block cave mines, the disadvantage of much drift and raise excavation, possible high timber cost, and the time element was considered. Putting in this system would have meant a grizzly level 50 feet, or higher, above the established haulage level. This would have left too low a block.

The other extreme would have been to go to a complete direct-loading slusher type such as that used by Climax Molybdenum Company at its Climax mine in Colorado. In such a type, due to little surge capacity, large-capacity, high-powered slushers are needed if quick loading of trains is desired. With Philex's limited haulage system, quick loading is very desirable. Inasmuch as

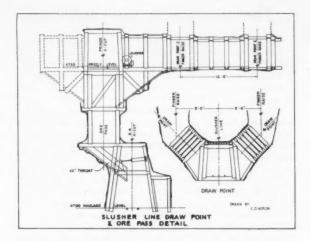
nothing was actually known about the way rock pressures might develop and how much ground support would be needed, this system was not attractive.

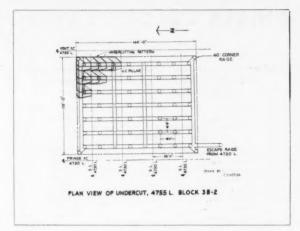
While more ore would have been made available per block, limited power plant capacity and financial limitations did not make the purchase of 75 horsepower slushers and related equipment attractive, nor the development of wide heavily supported slusher drifts.

Therefore, a partial-slusher partial-gravity system is used. This made more ore available than a full gravity type and gave sufficient block height (250 feet). A 30-foot vertical distance between haulage and grizzly (or slusher) level allows a surge bin type of ore pass to be used for quick loading of trains. This permitted the use of smaller (20 to 25 horsepower) slushers and equipment. It also meant the development of small size slusher drifts. It was felt that, if weight developed, it could be coped

How standard block was planned for accurate draw control, short

Based on results from the test block, the dimensions of the ore body, estimated caving rates, and tonnage requirements, a 100 by 120 foot standard block was established to begin with. With this as a start, the ore body was then divided into six 100-foot wide panels with a 30-foot pillar in between. These panels are subdivided into blocks with no pillars between. This allows the development of a longer or shorter block than the 120-foot length and also leaves open the possibility of going to a panel caving system if desired. The 100-foot width allows the use of slushers on one side only making a single pass under the block. As 100 to 120 feet has been considered about the economical length for slushing with medium size slushers, any block wider than 120 feet would necessitate slushers operating on both sides of the block with the tail sheaves under the block center. Our test block results indicated successful caving with a 100-foot width. For slushers, 25 horsepower units pulling a 36-inch wide 20-cubic-foot scraper at 250 to 300 feet per minute were chosen. We will eventually need 18 to 20 units. These move the muck fast enough to fill the ore passes without a long train delay. They also allow plenty of time for the slusher operators to open and close the finger raise stop boards which control the flow of ore from the fingers into the slusher lines. Ore pass capacity was designed for 20 to 25 tons. This was established as a possibly ideal amount to pull from each finger at a time. These passes are used as measuring pockets to obtain a reasonably accurate draw on the block. The capacity of these pockets is consistent with train capacity. Trains are made up of one 6-ton Diesel locomotive and fifteen 80-cubic foot capacity cars of the rotary dump type. The short height and wide throat of the ore passes help to eliminate hangups. For the sake of minimum excavation, these short vertical ore passes were placed in such a way that they can be used for the adjacent blocks and later on, the pillars. This meant some excess and somewhat intricate timbering, but the elimination of an additional ore pass more than makes up for it.





was learned about the mechanics of the rock, and more importantly the test showed the mine crew and staff what the basic block-caving process is.

The initial underground development consisted of driving a 1,200-foot tunnel and a 1,700-foot long adit toward the ore body. This, plus 1,800 feet of surface track comprises the single-track haulage level from mine

to crushing plant. Elevation of this level was determined by topography and surface rock condition as much as mill location. After the adit was driven 1,300 feet, work was concentrated on getting a 300-foot ore pass and manway through to surface for open pit ore. After this was completed, the driving of the haulage level toward the ore body was resumed.

before selecting partial slusher and partial gravity system

with in small drifts. Even if weight developed on the haulage level, the placement of some extra timber to take care of it was made worthwhile by the additional ore made available.

It was observed in the test block that the rock was like many little hard blocks lightly "glued" together and there was the possibility that any pressure transmitted through the body would not have the terrific deforming effect found in the caving mines of the southwestern United States. So far, not a bit of weight has developed in fringe and haulage crosscuts. It may be a year or more before it does. Then, the value of the small level interval in this ore body may be fully evaluated.

Other considerations taken in planning the mine layout were the need for superior ventilation to handle the Diesel locomotive exhaust, and water flow from heavy rains. Above all, simplicity was necessary in order to save time and expense in developing the mine, and also to facilitate expansion of the mine should economic conditions make possible the caving of lower grade rock on the south, west, and north sides of the ore body.

One of the main factors in planning the blocks was that of dimensions. With a daily capacity of 2,000 tons it did not seem particularly desirable to have such a large size stope that one or two would provide all the daily tonnage requirements. Too large a block could possibly develop uncontrollable weight. For this mining rate, four or five stopes give more leeway from the standpoint of balancing rich ore with lean. Maintenance of possible heavy ground areas in slusher lines is also a factor. With more slusher lines, the percentage of total production tied up by maintenance of slusher-line timber is minimized. On the other hand, too small a block will not successfully cave, as shown in our test block.

slushing, and fast train loading under positive ventilation

As can be seen from the mine plan map, the main haulage drift, supply and ventilation drifts, and supply and development raises are placed on the south side of the ore. This is to take advantage of the harder diorite zone, and therefore, less rock-pressure troubles. From these main drifts, crosscuts are driven north at right angles through the ore body. These haulage, supply (or fringe), and ventilation crosscuts are positioned to take advantage of any protection from rock pressures that might be afforded by the pillars between the caving panels. By using slushers the placement of haulage crosscuts directly under the blocks was eliminated.

Blocks are numbered by a simple system of rows and files, with a number added indicating the sequence of development. This sequence number is added when undercutting commences, rather than in the planning stage. Levels are numbered according to mean elevation above sea level.

In order to adequately ventilate the haulage and grizzly

levels, a long ventilation drift on the 4,755 level, above the grizzly level, is included. This can be compared to the exhaust manifold on an engine. Ventilating air enters the mine from the main portal, splits and flows north through the haulage and supply crosscuts, through raises and the slusher lines into a ventilation crosscut behind the blocks. The contaminated air flow is then south, into the manifold drift, and up a vent raise to the surface. At this time, the east half of the mine is so ventilated. The headings being driven into the west end are ventilated by other means. A special crosscut and raise is included to facilitate the movement of timber, machinery, supplies, and the mine crew without unduly impairing ore haulage on the 4,700 level. There is some restriction now due to the fact that there is only one access to the mine for ore trains, mine crew, and supplies. Eventually a cage or elevator will be installed in the W 1210 Supply Raise to speed up the movement of men and supplies to the grizzly Continued overleaf

PHILEX'S BLOCK CAVING

. . . continued from page 33

Timber and Explosives Used for Direct Development of Block 3B-2 At Philex Mining Company's Santo Tomas II Block Cave Mine

Use	Board Feet
TIMBER	
Haulage crosscut (72 feet to 3B-2)	3,800
Fringe crosscut " "	3,700
Ventilation crosscut " "	3,700
Ore passes	12,100
Slusher lines	70,500
Finger raises	20,700
Undercut lines	none
Corner raises	none
	114,500
$\frac{114,500}{300,000} = 0.38 beard$	feet per ton ore
EXPLOSIVES	
Use	Pounds
Haulage crosscut	1,900
Fringe crosscut	1,500
Ventilation crosscut	1,300
Ore passes	1,000
Slusher lines	3,700
Finger raises	3,500
Undercut lines	4,200
Corner raises	400
Undercutting	5,300
	22,800
22,800	
300,000 = 0.076 poun	d per ton ore

Machinery Used at Philex Mining Company's Santo Tomas II Block Cave Mine

Number	Description					
	PRODUCTION					
3	GT Diesel locomotives with tarque converters, Schoema (German).					
36	80 cubic foot, box type, rotary dump, eight wheel ore cars.					
5	25 horsepower Joy B2F-211 double drum electric slushers.					
3	25 horsepower Pikrose (English) S2A double drum electric slushers.					
5	Joy-Amsco 36-inch-20 cubic foot scrapers.					
3	Pacific 36-inch—20 cubic foot scrapers.					
8	42-inch arc gates with 8-inch compressed air rams.					
	DEVELOPMENT					
- 7	GD FL48 airleg drills.					
7	Atlas-Copco "Lion" airlegs.					
8	Atlas-Copco "Falcon" stopers, drill steels tungsten carbide integral bits, chisel type, 5-foot to 13-foot (for undercutting).					
4	Eimco 12-B mucking machines.					
1	Mancha 1 T battery locomotive.					
2	Joy 5211 5 horsepower double drum air slushers.					
1	Joy FF211 71/2 horsepower double drum air slusher.					
3	Pikrose \$1 10 horsepower double drum air slushers					
12	Assorted 1 to 10 horsepower single drum hoists,					
	VENTILATION					
4	La-Del 30-inch, 7½ horsepower, 10,000 cubic feet per min- ute axial flow fans.					
6	Sturtevant 22-inch, 5 horsepower, 6000 cubic feet per minute axial flow fans.					
2	Joy 18-inch, 10 horsepower, 6,000 cubic feet per minute axial flow fans.					

COMPRESSORS

IR PRE-2, 1,200 cubic feet per minute, 225 horsepower.

GD HAD 650 cubic feet per minute, 125 horsepower.

Terrain makes long ore haul;

Haulage, at present, is by a push-pull method. Empty trains are pulled into the mine, loaded at any two open-pit ore passes, eight block ore passes, or three development muck raises, and then pushed back out of the mine to the rotary dumper at the crushing plant. The length of haul is now about 5,000 feet.

This haulage system has been adequate to maintain production for the past year and a half, but will not be large enough to efficiently handle all the loading points from three or four more blocks. There are also safety and train maintenance problems now. Therefore, a figure eight system is being developed, consisting of one small loop on the crusher end and a set of loops through the block area. This should be in effect by the end of the year. A full loop may be desired to handle higher tonnage in the future from this level; this too has been designed.

Heavy water flow is anticipated, especially after more blocks are developed. We are trying to take care of this in several ways. The first heavy rain since the first block subsided was typhoon "Freda." There is little that can be inexpensively done to divert the run-off on the surface

Caving starts fast and closely

Block IC was chosen as the first block to develop. It was perhaps not the quickest block to get to, but it was out of the way of the pit operation. A failure of some sort, such as arching over of the caving block, would have caused a dangerous condition for the work being carried out on the surface. On the other hand, excess subsidence around the block could also have interfered with the pit.

A fault was found running across the northeast tip of the high grade core, so we placed the block up against this in order to help caving action. Although a 100 by 120-foot block was tentatively set as a standard size, we added one more 40 foot panel to make it a 100 by 160-foot block. This was done in order to help promote caving action and also to obtain higher production. Grade of ore promised to be approximately 1.0 percent copper based on earlier diamond drill data and lower level channel samples. A later reappraisal using more assay data from the upper section of the block showed it to be around 0.7 percent. Final specifications of Block 1C-1 are shown in table.

The short ore passes were difficult to put in. Not know-

First block positioned out of

Undercutting was done by the Miami-Inspiration, Arizona, method. Starting in one corner, sections of the pillars and perimeter were methodically drilled and blasted out. The line of pillar cutting retreated diagonally across the block to the opposite corner. In this manner, the removal of the blasted undercut muck was simultaneously accomplished by all of the electric slushers, not one at a time. Briefly, the undercutting took seven weeks and 1,200 manshifts to drill 7,000 holes totaling 61,000 feet. One hundred eighty-eight boxes of dynamite were used. Forty-four separate blasts were made; the largest using 2,800 sticks of powder. The undercutting was successful.

We drove no boundary caving drifts as has been done for many years in some of the caving mines. The multitude of slippage planes throughout the rock structure gave all the indications of sufficient weakening for caving action. However, 25-foot high corner raises were driven off the undercut level to help break away the corners.

lower drainage adit planned

after several blocks have subsided, so we allowed the caved area to fill up with surface mud and water in order to see what would happen. The results were that water flow increased in the solid rock fissures and through the broken ore in the block. Muck flow out of the fingers, however, was negligible, which was encouraging.

Underground, the heavy water flow expected after more ground has subsided is to be handled for the next couple of years by deeper ditches and a drainage adit to be driven five feet lower than the haulage level. This should keep the track from being flooded and impairing or stop-

ping production haulage.

Learning from "Freda," surface waste from the open pit is being dumped into the subsided area to minimize the water catching area. The result was that typhoon "Lucille" this year had no appreciable effect on underground water flow. This waste also serves to maintain the walls of ore in adjacent undeveloped blocks and prevent excess dilution. An additional benefit is short haul of waste from the pit. There is very little waste capping to follow down above the blocks, as in the southwestern United States.

follows undercutting

ing what to expect in the way of rock pressures, we designed a cribbed raise with a square set and ore slide atop that. Once these were in, driving the rest of the supply or fringe crosscuts and the slusher lines was not difficult. There were some problems in maintaining grade and positioning the timber. Timber had to be well aligned in order to prevent tearing up the timber with the scrapers. Finger raises had to be positioned reasonably close to plan. Getting the drawpoints and finger raises started was tedious, but once the crew got the hang of timbering, they went fast. Only the first six feet of the fingers, the drawpoint, is cribbed, in order to preserve the rock pillar over the slusher lines. The rest of the finger, up to the undercut, stood well enough without timber. Undercutting drifts and crosscuts were driven across the tops of the 48 fingers leaving 15 large pillars and the perimeter to support the block. Again, timber was found unnecessary in these temporary lines. From the time we first entered the area of the block, it took five months to develop the block up to the undercutting phase.

way of open pit mining

Some exploration drifts and crosscuts were driven part of the way around the block. Driven from the manway of the No. 2 open pit ore pass manway, this 4890 exploration level served two purposes: 1. To obtain more assay values in the upper part of the blocks and, 2. To provide some extra weakening for caving. If the first block had arched over and caving ceased, we would have used it as a coyote hole to blast it loose. Not true-caving, perhaps, but it would have been the solution for eliminating a dangerous situation.

Caving of the block proved to be much faster than anticipated. After 30 percent of the block had been undercut, caving commenced. This first caving action channeled up along a fault. After that, the pillar faces were crowded by caving rock from behind them. We pulled the fingers quickly in order to make room for blasting the pillars. Although this helped make some room for blasting, the main result was to make more room for the fast caving rock. The first subsidence, a hole about 30 feet in diameter,

Block Caving Data For Philex Mining Company's First Two Blocks at Santo Tomas II Mine

Item	Block 1C-1	Block 38-2
Lenth, feet	160	144
Width, feet	100	115
Height, feet	290	250
Tonnage	325,000	300,000
Estimated grade, percent copper, ounces gold	0.70 Cu, 0.026 Au	0.79 Cu, O.222 Au
Area of undercut, square feet	16,000	16,560
Mill hole spacing	16.6 by 20	16 by 18
Number of finger raises	48	56
Area drawn per finger, square feet	333	300
Number of slusher lines	4	4
Size of slusher lines	5 by 5.5	5 by 5.5
Slusher, horsepower	25	25
Slusher speed, feet per minute	250	250
Scraper capacity, cubic feet	20	20
Spacing of slusher line, feet	40	36
Height of corner caving raises, feet	25	40
Height of undercut above slushers, f	set 25	23
Height of grizzly above haulage level	, feet 30	30
Size of fringe and vent crosscut, fee	5 by 6	6 by 7
Size of haulage drifts, feet	7 by 7	7 by 7
Size of ore passes, feet	5 by 3	5 by 5
Capacity of ore passes, tons	20	20

Development Footage For Philex Block Caving

Heading			Total Footage
4700 haulage level			6,940
4730 grizzly level and 4755	ventilati	ion level	6,480
Development and ventilation	raises		1,025
Drainage and exploration d	rifts		4,360
Total capital development (85 percent by June 1960		when completed	18,805
Estimated tonnage to be mir	ned	=	3,970,000
18,805 3,970,000	=	0.0047 feet p	per ton
	OR EAC	H BLOCK	
Total footage (ore passes, : lines) for one block	slusher li	nes, finger raises, u	undercut 3,320
Estimated tonnage in each	block	=	300,000
3,320 300,000	=	0.011 feet pe	er ton
Total footage per ton		0.0158	

Underground Mine Crew Caving Costs, First Block

Number	Classification	Charge	Pesos
	MINE STAFF		per Tor
4	Mine superintendent Shift bosses	Capital development	0.15
2 3	Development bosses Draw bosses (1 per block) Haulage bosses	Block development Haulage	0.30
14	MINE CREW	Production equipment amortization Direction operation of bla	0.05
15 60 15	Haulage crew Miners and muckers Others	Labor 0.	04
90		Blasting Timber repairs None	Nil ·
1 1 1	Mine engineer Stope control engineer Development engineer	Compressed air 0.	06 01 .01
3 Total	107	Total	0.14

PHILEX'S BLOCK CAVING

. . . continued from page 35



ELECTRIC SLUSHERS are used. George Henry, mine superintendent (left) and George A. Scholey, mining consultant, check slushing.



CAVED BLOCK breaks through to surface at edge of open pit. Cave was vertical, but piping shows by hole at far left.



SLUSHING is no problem because the caved ore breaks to almost uniform size, less than a 6-inch cube, as shown here.

appeared on the surface before undercutting was finished. Shortly afterwards, two more holes appeared along parallel faults. When this happened, it became difficult to break up the sides and the ridges between the holes. The draw from the fingers was altered in many ways in an effort to completely break the block. After several months we finally accomplished this, but at the expense of some waste rock, including conglomerate creek boulders, following down into the ore through the first pipes.

The draw has since become fairly routine. Over 200,000 tons averaging 0.65 percent copper and 0.018 ounce gold per ton have been drawn to date. Pipes do form and have to be broken up. We have found that if a finger is drawn twice successively we get a pipe. Sometimes a pipe forms when two adjacent fingers are drawn. We have had large creek boulders and even tree roots appear at the fingers. These have been dealt with in this block by varying the methods of draw and slowing down the rate of draw. The rate of draw compares favorably with the southwest caving mines. One of the undesirable features that we are striving to eliminate is piping action whenever we make a fast draw. Surface boulders work themselves down through the broken ore and plug fingers, making drilling and blasting necessary. There are some hard quartz stringers in the ore which break with difficulty. We feel that slight changes in dimensions of the block and finger raise spacing, plus improved undercutting and drawing techniques, may cure most of this.

More fingers in second block

Specifically, on Block 3B-2, we are using a shorter and wider block. See Table No. I for details. The finger raise spacing is smaller with the tops of the fingers widened more than was done in 1C-1.

By going to a wider block, we have narrowed the pillar from 30 to 15 feet. The vertical subsidence of the first block, and the absence of any rock pressure, so far, indicates to us the feasibility of eventually eliminating this pillar. Some excellent advice concerning this has been furnished so we are gradually working toward that end. By doing so, we might get a bit more dilution from completed blocks containing waste, but on the other hand will easily mine more ore. Inasmuch as no weight has developed in the slusher lines of Block IC-1, we have placed less timber in Block 3B-2. Included in this is a more simple ore pass. We are developing slightly larger fringe crosscuts. Corner raises 40 to 50 feet high were driven instead of 25 feet.

In undercutting 3B-2 the same basic method of knocking out pillars and retreating was used. However, the drilling pattern was changed from radial vertical holes in the back to long inclined slabbing cuts. This meant the greater use of long steels, up to 13 feet. Because the slabbing cut enabled drilling out of the way of the caving muckpile it was possible to hold the initial draw of pillar muck at a slower rate and avoid excess caying,

This present caving level can be considered as experimental to a certain degree. We know the ore body exists below, but not how far. Further diamond drilling is in progress to find out. Another exploration level is tentatively planned 200 feet below the 4700 level. When the ore body is delineated in depth, and much experience has been obtained from the present caving level, it should be possible to plan and put into effect a nearly perfect mining plan incorporating new and modern method of rock support and particularly ore transportation.

The aid and assistance given by J. B. Fletcher, W. F. Sloan, H. Blee, and J. Fugate of Miami Copper Company in learning block cave methods, systems, and layouts is gratefully acknowledged.

Argentum Mining Co. Revives Candelaria

Mills Old Dumps

Develops Open Pits

The old Candelaria Mining district, 53 miles north of Tonopah, Nevada, is the scene of bustling activity these days. This old silver camp is having a rejuvenation due to the ambitious plans of the Argentum Mining Company and the Argentum Consolidated Mines, Inc., who are spending \$2,000,000 on an expansion program. The capacity of their small cyanidation mill, on the north side of Columbus Salt Marsh, is being increased to handle over 4,000 tons of low grade silver ore a day. This ore will come from old dumps and from new open-pit mines in the Candelaria district six miles north of the mill. Construction on this expansion project began in late 1959 and will continue to 1961.

Silver ore was discovered in this part of Nevada in the 1850's. By 1876 the rich ores of the Northern Belle, Holmes, Mount Diablo, Lucky Hill, and other mines supported the thriving town of Candelaria with some 2,000 people. However, by 1928 the rich veins had thinned out and the plus-20-ounce-to-a-ton silver ore was depleted. Today nothing remains of Candelaria except a few stone walls and foundations—typical of many western ghost

In 1950 Mr. Eugene S. Gates, Sr., of Mina, Nevada, purchased claims in the Candelaria district, and built a small flotation mill at Columbus Marsh in 1951. This mill proved only moderately successful and was converted to a cyanidation operation in 1958. The capacity of this rebuilt mill was some 200 tons a day averaging 6.5 ounces of silver with 0.02 ounces of gold.

During 1957 and 1958 extensive exploration work was carried out by Gates and Mr. James G. Goldsworthy, an experienced geologist. Credit should be given Mr. Goldsworthy for reinterpreting the geology of the Candelaria district by his discovery of several shallow ore zones. Over 540 drill holes delineated large tonnages of silver ore averaging 10 ounces of silver per ton. This ore occurred disseminated, in fine stringers, and in rich pods. In addi-



GENERAL VIEW of the expanding Argentum mill on the north side of the Columbus salt marsh, 53 miles north of Tonopah.



EUGENE S. GATES, JR., President of Argentum, lives at Mina, Nevada.



JAMES G. GOLDS-WORTHY is superintendent of mining and milling.

tion, extensive mine dumps were sampled and found to assay up to eight ounces of silver per ton. Thus, there was ample justification for the expansion program which began in 1959.

To obtain financing the company made a special arrangement with the Southwest Machinery and Equipment Company of Phoenix, Arizona. Under an unusual "lease back" contract the company has been able to obtain necessary buildings, machinery, and equipment on a rental basis without tying up valuable working capital. Thus, a 130 ton-per-hour primary Traylor jaw crusher with a rated capacity of 1,100 tons a day is replacing the present portable 170-ton-a-day Pioneer crushing plant. Two Pioneer secondary gyratory crushers of 70 tons an hour capacity have been acquired. A new 9- by 8-foot Marcy ball mill with a rated capacity of 160 tons an hour has been placed alongside the older 7- by 6-foot Allis-Chalmers ball mill. Both of these grinding units operate in closed circuit with Wemco spiral classifiers. A total of 56 sand leaching and agitation tanks are being erected, varying in diameter from 30 to 60 feet. Two Dorr 45-foot primary thickeners have already been completed as well as a 280,000 gallon water storage tank.

At the mines in Pickhandle Gulch new buildings have been built for warehousing, machinery and staff requirements. A fleet of 20 Utility dump trucks of 30-ton capacity is being acquired. Seven of these trucks have been delivered and are now in use hauling dump ore to a large stockpile beside the mill. In addition to truck haulage a six-mile aerial tramway is to be erected. This tramway was purchased from the Cerro Gordo Mine in California and is now at the Argentum property.

Mining and milling is continuing during the expansion program. Production at the mill during July was approximately 1,000 tons a day and is expected to reach 4,000 tons by the end of 1960.



WASTE DUMP of the Northern Belle mine and ore from nearby open pits supplies feed for the 4,000 ton per day mill.

ARSENIC PROBLEM

of Marietta gold ore finally solved by selective flotation

by William Rogers Wade

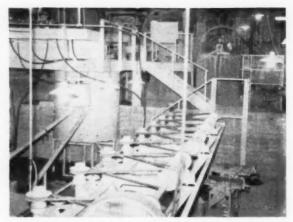
After many years of trying to cope with a complex arsenopyrite-pyrite, gold ore with lead and silver values, the Northern Milling Company recently put a new mill into operation that has finally beaten this tough metallurgical problem. This new 200 ton-per-day selective flotation mill was erected in 1959, and is now producing high grade gold concentrate with low arsenic. Handling this difficult ore from the Marietta mine successfully is an achievement of careful planning, research and financial courage.

The Marietta mine is situated in the Park district about 10 miles in an air line west of Townsend, Montana near the head waters of Indian Creek. It is reached by a good gravel road 15 miles up Indian Creek. The altitude is 7,145 feet at the lower tunnel. Earliest gold production came from the placer gravel on Indian Creek in 1870. These workings produced about \$1,000,000 in pioneer days. More recently the creek was worked by modern drag lines for a distance of nearly four miles.

Early-day placer mining led to the discovery of several gold veins, both in the Park and Hassell districts which lie on the southern branch of Indian Creek-five miles from the Marietta mine. Prior to 1930 the various gold veins produced another \$1,000,000 from shallow workings in the oxidized zones. At least seven mills have been built in the Park and Hassell districts attempting to treat the arsenical sulphide ores below the oxidized zone. All failed to make economical recoveries treating the massive arsenopyrite-pyrite gold ores that occur under the oxide zone. The district existed by shipping high grade handsorted ore to ASARCO's East Helena lead smelter or to Anaconda Company's copper smelter. The largest and most consistent producer in the area is the Marietta vein. While there are no reliable detailed figures the total production up to 1956 was valued at about \$500,000.



Mr. Wade is a consulting mining engineer and designer of flotation mills, Marysville, Montana.



FLOTATION section of mill with roughers in foreground and conditioner at left. In background is the grinding section.



NEW MILL has 200 ton per day capacity. This winter picture shows large doors on each level for truck delivery of supplies.

The difficulties with these direct smelter shipments were:

- The lead smelter at East Helena penalized for all arsenic over 2.0 percent and had a high treatment charge. Some of the ore ran 8.0 to 10.0 percent arsenic so the smelter penalty was heavy.
- The copper smelter at Anaconda did not penalize arsenic, but it did not pay for the lead. However, freight costs were higher because of the greater shipping distance to East Helena.
- Only hand-sorted ore was rich enough to stand shipment to the smelters. About two thirds of the ore as mined had to be left in the stopes as gob.
- To ship to the smelters the ore had to be trucked 15 miles to the railroad at Townsend if being shipped to Anaconda, hauled 50 miles if trucked into East Helena, or loaded in railroad cars and shipped the last 35 miles from Townsend.
- As an example, gold ore with a little silver and lead with a gross value of \$29.00 per ton netted at the smelter after deductions, treatment, trucking, and penalties less than \$9.00 per ton or one third its value.



FLAT VEIN dips 23° in this over hand open stope above No. 5 level. AirLegs are used for drilling. Stulls are placed as needed.



BROKEN ORE from flat stopes is slushed directly into cars. This double drum slusher is loading on No. 5 level.



RECLAIMING DUMPS with a belt conveyor leading to crushing plant. Belt hopper is filled by a Caterpillar front end loader.



PORTAL of main adit on No. 5 level, Diesel locomotives pull string of cars through adit to top of mill ore bin.

Mr. Al Dance took over the property in 1915. Many years later with his son-in-law, Mr. Harry Anders, he mined and shipped to the smelters several hundred dollars worth of ore. The future of the mine and the district as a whole depended on someone with the necessary capital, courage and ability to take over the property and solve the metallurgical problem. The Northern Milling Company acquired the property in 1958. The company put the mine into operation with a new 200-ton selective flotation mill and is now making high grade gold concentrates with low arsenic.

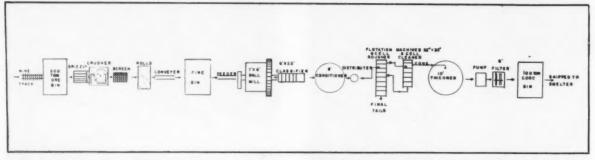
Geology and ore bodies

The country rock is andesite. This rock covers an area of about 15 miles east and west and 30 miles north and south. It is younger than the carboniferous-Devonian limestones and shales but older than the quartz diorite of the Boulder Batholith which lies to the west. Outlying stocks and cupolas from the Boulder Batholith intrude into the andesite. These stocks and cupolas are granodiorite or quartz diorite and are the source of the mineralization in veins in the older andesite.

The Marietta mine has developed several veins, all in the andesite. They vary in strike and dip. The E and W, or northeasterly and southwesterly, veins such as the Gold Dust and Switzland are small— two- to four-foot wide fissures dipping 40° to 50° to the east. They carry more lead and silver, and less gold, than do the northerly and southerly Marietta and Little Anna veins.

The Little Anna vein parallels the Marietta and is credited with a past production in early days of about \$200,000 from hand-sorted ore. The Marietta is the most important vein with a four- to six-foot width or thickness. It strikes nearly north and south, and dips gently west at 10° to 25°. It appears to occupy an overthrust fault that slipped along a bedding plane of the andesite. The displacement is small.

The ore in all these veins has similar characteristics. Ore is massive sulphides, pyrite and arsenopyrite, with a little chalcopyrite and sphalerite carrying galena, gold, and silver, with minor amounts of bismuth and antimony. The sulphides were deposited first at higher temperatures followed by the gold at lower temperatures. The sulphides are mesothermal and carry a small amount of gold in solid solution in both the pyrite and the arsenopyrite, but are not high enough in value to make these sulphides commercial. As the temperatures lowered, gold followed and deposited on the pyrite and arsenopyrite, and in microscopic cracks in the sulphides. The gold is free metallic gold but extremely small in particle size. So fine, in fact, that it is only with the greatest difficulty and the most expert operation that any gold can be panned. However, a large percentage of the gold has been amalgamated in the laboratory in tests. Commercial amalgamation is



FLOWSHEET stresses simplicity of pulp flow. Capacity is adequate to double-clean lead concentrate for high lead content

ore, Close pH control and limited use of potassium permanganate depress arsenic without gold loss.

not possible because of the fouling of the mercury, probably because of the arsenic. Sodium amalgam and several other "mercury tricks" were tried without good recovery, and from the action of the mercury it was easy to see why amalgamation mills failed in the past.

The ore bodies occur in definite shoots that extend down the veins raking to the right 20° to 25° when looking down the vein and facing the hanging wall. These shoots are of various lengths, varying from a few up to 300 feet, and in width from one foot in the narrow parts to four to six feet where thickest.

Development work has been done in, and ore has been mined from nine other veins besides the Marietta. However, ore in all of them falls into one or the other of two classes: low lead and higher gold or higher lead and lower gold, with plenty of arsenic in each. The table shows typical analyses of the better grades of ore from the two different vein systems.

The arsenic in the oxidized ore occurs as the mineral scorodite, a hydrous ferric arsenate (FeAs₄2H₂O). The lead occurs as cerussite and the iron as hematite or limonite. The gold is 80 to 85 percent free in the sulphide ores and 95 percent free in the oxide ores, but amalgamated only with great difficulty in either ore with high loss.

Laboratory work has shown that the gold can be cyanided from the oxide ore with good recovery, but it can not be cyanided from the sulphide ore successfully. Here the recovery is 35 percent in the unroasted ore and only 45 percent after roasting. As there is very little oxide ore to treat, (the sulphides come close to the surface) a cyanide plant has to treat sulphide ore. Two such plants

STAFF: Tan Lee, stope control; Ed Wieglanda, superintendent; Bea Rea, office; Pete Sweeney, geologist; Paul Raber, president.

built in the past both failed to make a profitable recovery of the gold.

Try many recovery processes

There have been several attempts made in the past to treat these arsenical ores from the Park and Hassell districts. The first attempts were to amalgamate with stamp mills

A gravity experimental concentration plant was tried later as a means of reducing the silica and insolubles in the ore. This raised the grade somewhat and was used as a temporary milling device until the metallurgy could be solved and a plant built that would produce a high grade product low in arsenic and acceptable to the lead smelter.

A cyanide plant erected several years ago was an economic failure on the sulphide ore because of the low gold recovery. It could not recover over 35 percent of the gold even after a long leaching time.

In 1907 a Mr. Allen Mason built a mill for the Marietta using a combination of gravity concentration and cyanidation. He could not make a satisfactory recovery, and after losing \$150,000 gave up.

Some years ago a small flotation mill was tried in the district but closed down. The probable reason was poor metallurgy and use of incorrect reagents. There is no information available about this plant.

How metallurgical problem was solved

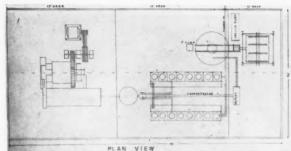
In 1959 the Northern Milling Company had research done, under the author's direction, on the Marietta ore by Booth & Company of Salt Lake City, Utah. Mr. Sam Mele, the chief metallurgist, solved the metallurgical problem and deserves much credit for his work.

In the summer and fall of 1959 a 200-ton daily capacity selective flotation plant was erected at the Marietta. It is now doing a very successful milling operation producing high grade concentrate, low in arsenic, with good recovery.

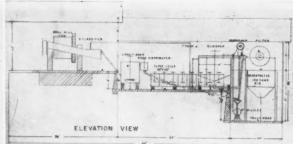
The following laboratory results were used for the design of the mill and the layout of the flowsheet. Sulphide ore used in the tests assayed as follows: 0.84 ounce gold, 2.3 ounces silver, 1.2 percent lead, 1.2 percent zinc, 22.4 percent iron, and 6.0 percent arsenic per ton.

The ore was ground 86 percent minus-200-mesh. The following reagents were ground with the ore in the ball mill: 1.0 pound of lime per ton, 1.5 pounds of soda ash, and 1.0 pound of sodium sulphite (Na₂SO₃) per ton.

The ore pulp was then floated for 5 minutes at a pulp density of 30 percent solids using 0.04 of a pound of Z-6 (Bear Xanthate) potassium pentasol amyl xanthate with 0.03 of a pound of Dow 250 frother. This produced



EQUIPMENT is carefully positioned for simplicity of operation and easy maintenance. Only one pump is needed in the mill.



Plan shows how floors were arranged for minimum of excavation and easy construction. Concentrate bin is inside heated building.

a rougher concentrate assaying 14.15 ounces gold, 38.70 ounces silver, 20.80 percent lead, 4.15 percent arsenic, 29.80 percent sulphur, and 27.00 percent iron per ton.

Rougher concentrate was refloated in one cleaner operation with the addition of 0.05 of a pound of potassium permanganate (KMnO₄). This gave a cleaner concentrate assaying as follows: 24.55 ounces gold, 49.79 ounces silver, 27.20 percent lead, and 3.19 percent arsenic per ton.

The gold recovery was 80 percent. The best pH was found at 8.5. Sodium cyanide was tried as an arsenopyrite depressant but it did not give as good results as potassium permanganate. Because of the extremely finely divided size of the gold particles it caused an appreciable loss of gold by solution. Sodium sulphite (Na2SO3) and potassium permanganate, after many tests, gave the best result in depressing the arsenic without loss of gold. However, potassium permanganate has a depressing effect on silver and lead sulphides, but is not serious if the potassium permanganate is used in limited amounts. The mill in actual commercial operation has, at times, been able to reduce the arsenic to only 2.7 percent in concentrate assaying over 30 ounces gold per ton. However, as a general rule the arsenic is a little over 3.0 percent in the concentrate. This is not very objectionable as the arsenic penalty generally is 50 to 60 cents per ton of concentrate.

It has been found that the grade of concentrate is very dependent on the amount of Z-6 used per ton. Generally about 0.04 pounds of Z-6 is required to save the gold. However, up to 0.06 or 0.08 pound per ton can be used if the lead content of ore increases.

The amount of Z-6 has to be held to just what is required for the amount of lead, gold, and silver. An excess activates the arsenopyrite and this in turn has to be fought and controlled with more depressants. They in turn begin to depress the gold into the tailing.

Economically, it is more important to produce a high grade concentrate with a lower mill recovery than to produce a lower grade concentrate at a high mill recovery. Smelter payment for gold when under three ounces per ton in the concentrates is at the rate of \$31.818 per ounce. If the gold is over 10.0 ounces the payment is at the rate of \$33.03 per ounce.

The following example illustrates this point. Consider eight tons of 3.0 ounce concentrate compared with one ton of 24.0 ounce concentrate. Both contain the same amount of gold. The smelter payments then are:

Gold (3.0 oz. at \$31.818) = \$95.46 per ton Trucking to smelter = \$3.50 per ton Treatment = \$10.00

Net per ton is \$81.96 and for eight tons is \$648.68. This is to be compared with:

Gold (2.40 oz. at \$33.03) = \$792.72 Trucking to smelter = \$3.50 Treatment = \$10.00 Net per ton is \$779.22. The gain is \$130.54 in selling the same amount of gold to the smelter. If the mill made an 82 percent recovery on 3.0 ounce concentrate and dropped to 78 percent recovery on 24.0 ounce concentrates, the higher grade concentrates with the lower recovery would bring more money per ton of ore milled. The difference will be from \$1.15 per ton when milling very low grade ore to \$3.00 per ton when milling good grade ore. We also gain another very important advantage: making a product low enough in arsenic so that the lead smelter will buy it.

Close control of Z-6 for high recovery

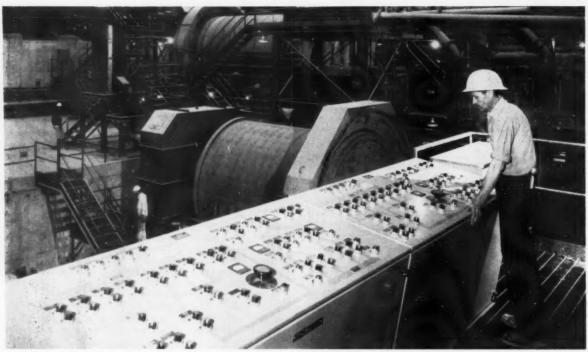
The mill, at times, has made a concentrate as high as 42.0 ounces gold and 80.0 ounces silver per ton from ore as low as 0.40 ounce gold. The tailing assays 0.08 ounce gold and the recovery is 80 percent. This is a \$1,443.50 concentrate. The ratio of concentration is 132 tons into one. The average lead content of the concentrate is 20 to 25 percent. If the ore is high in lead without a corresponding increase in gold content it may become necessary to double clean the concentrate to maintain a high grade gold content. As the mill is set up this can be very easily done and the change would only take a few minutes. This will not be necessary with Marietta vein ore, but may become necessary with the ore from some of the other veins that carry more lead.

Mr. Paul Raber, the president and manager of Northern Milling Company, and his staff deserve much credit for the careful and exacting work they are doing in milling this difficult ore successfully. The author wishes to acknowledge the help they have given him in preparing this short article.

Analysis of Various Ores From Veins in Park District, Montana

	N. & S. System	E. & W. System	Oxide Ore
Constituent	Marietta	Gold Dust	Ma-iet'a
Gold ¹	0.84	0.25	0.4
Silver ¹	2.3	6.2	2.0
Copper ²	0.15	0.10	0.04
Lead ²	1.2	6.12	1.59
Zinc ²	1.2	7.78	0.25
Iron ²	22.4	19.41	12.22
Arsenic ²	6.0	6.21	1.73
Sulphur ²	25.0	21.6	0.25
Antimony ²	0.4	0.2	0.10
Insoluble .	42.0	34.6	68.11
Oxygen ² , ³	-	_	13.31
TOTALS	101.49	101.93	100.00

^{1.} Ounces per ton. 2. Percent. 3. By Difference



GRINDING CONTROL at Duval Sulphur and Potash Company's new Esperanza copper mill is centralized at this modern

console. This mill near Tucson, Arizona was first to use the Marcy 12.5-foot diameter 16.0 foot long rod mill.

New Equipment for Today's Flowsheet

by R. L. Druva

The sciences of milling and mill design have seen no recent revolutionary ideas, but there has been a steady and positive advancement of techniques. A few of these developments are reviewed in a flow sheet order.

The actual art of crushing has received very little attention. However, we note considerable excitement among domestic operators over a German impact type crusher called Hazemag. This crusher was introduced to this country about six years ago. From all reports it has gained a very enviable reputation in the field where selective crushing and cubed products is paramount. (See Mining World, February and March 1960, pages 48 and 40 for details.)

Although crushers have not changed, we notice several successful applications of crusher automation and control. During the last year we saw the successful operation of a completely automated crushing plant, wherein three stages of crushing and

fine ore storage were accomplished at the amazing rate of 500 tons per man hour. This was made possible through the use of variable speed feeder drives, automatic variation of crusher mantle settings, automatic load changing chutes, thermal converters, and off-the-shelf instrumentation lines,

The trend continues toward increased screen sizes. Operators seeking increased production within existing structures find that one large screen does the work of multiple smaller units, with resultant space and maintenance savings.

No longer are we amazed at the sight of a screen 7 or 8 feet wide and 16 to 20 feet long, nor are we impressed when the screen operator reports that this screen is handling a load of 2,000 tons per hour.

The trend toward larger grinding mills continues. More attention is being directed toward the autogenous grinding mills with their advantages of lower steel and power consumption. This form of grinding was given a great boost when Quebec Cartier Mining Company selected Hardinge cascade mills for its Lac Jeannine iron ore plant in Canada. These mills are 18 feet in diameter, but indications are that we will see 30-foot

diameter autogenous mills soon.

Recent users of large grinding equipment include Duval Sulphur and Potash Company with its 12.5 foot diameter by 16.0 foot long rod mills, powered by 1,500 horsepower motors. Also Loma Negra cement in Argentina with its 12-foot diameter by 34 foot long ball mills powered by 2,500-horsepower motors.

Considerable interest has been generated in a new grinding mill called the D'ore mill. This unit consists of a cylindrical drum composed of a number of parallel keystone shaped rings. Riding on these rings is a heavy single roll slightly shorter than the mill drum with an outside diameter approximately one-half that of the inside diameter of the drum. This roll, being free to move, rolls constantly toward the bottom of the drum upon a blanket of feed material entering through the opening in the mill head.

Recent tests on this mill by some of the larger iron and copper producers indicate that:

- Metal parts wear appears to be less than 50 percent of conventional mills.
- Power consumption appears to be less than 40 percent of conventional mills.

Mr. Druva, an engineer for Stearns-Roger Mfg. Co., Denver, Colorado, presented this paper at the Colorado Mining Association's

 This mill will accept and economically grind feed material in particle sizes larger than conventional mills . . . thereby, in many cases, eliminating one stage of grinding.

In today's large tonnage mills, mammoth classifiers with rakes or spirals and heavy drives are a sight to behold. Undoubtedly, these large heavy-duty classifiers will continue to operate alongside the huge grinding mills in the non-metallic processing plants for years to come.

To say that the rake and spiral classifiers have reached their limit in design and capacity would be a hazardous prediction. The experience factor in the use of these machines will continue to exert a strong influence on today's metallurgists and mill designers.

During the past 13 years a new concept in classification has been subjected to extensive study and experimentation. I refer to centrifugal classification as accomplished in stationary cyclones. The controversy between proponents of rake, spiral, and cyclone classification will continue for many years to come.

In the past year we have seen additional development and experience in the use of a new classification tool known as the DSM screen. This screen, developed by the Dutch State Mines, accomplishes a two-product separation by means of special screen surface rather than by gravity settling or application of centrifugal force. It shows remarkable efficiencies in the 8 to 48-mesh range.

Considerable activity and controversy raged this year between the

proponents of dry magnetic separation versus the generally accepted wet process. The Dings Magnetic Separator Company of Milwaukee, Wisconsin jumped into the contest by announcing its new electrostatic separator called the "Coronatron." New users of this unit report exceptionally clean mineral separations at relatively low capital and operating costs.

Great strides have been made by the iron ore companies in the pelletizing processes which have lowered agglomerating costs. Erie Mining Company's shaft furnaces in Minnesota were reported to be under modification, and they are adding two experimental pelletizing furnaces to their existing 24 production units. Meanwhile, research on shaft pelletizing furnaces was continued by Bethlehem Steel Company at Lebanon, Pennsylvania, with reported improvements in efficiency. Reserve Mining Company at Silver Bay, Minnesota, continued to improve the performance of its traveling grate pelletizers to improve hardness of product and efficiency of fuel.

Cleveland Cliffs Iron Company near Ishpeming, Michigan, is nearing completion of the first commercial application of the Allis-Chalmers grate-kiln method of iron ore pelletizing. The operation of this unit will be watched carefully by everyone in the industry.

In recent months two large iron ore producers have announced the construction of large-scale pilot plants to study the beneficiation of semitaconites on the west end of the Mesabi Range. In both cases the process is based on the roasting of these lean ores under a controlled atmosphere in Lurgi type kilns. After roasting, the ores are further treated in magnetic separation circuits similar to those used in the large taconite plants on the eastern end of the range. It is hoped that these plants will help provide the badly needed answer to the dwindling United States iron reserves.

Remote control of mill pumps by industrial radio systems has grown in use. This is especially valuable where a mill's water supply is from a series of remote wells.

Additionally, there has been an increasing use of miniaturized instruments in order to provide greater control from any single control panel. Also, there are more and more control panels of the flow sheet type for better control by new operators, increased use of interlocking devices, and starvation and rotation switches.

Here are some miscellaneous items observed recently in milling and mill design:

1. An increasing trend toward automated variable-speed drives on slurry pumps.

2. The use of chemical plant techniques in the design of ferrous and non-ferrous processing mills.

3. An increasing use of template and model layouts to decrease engineering and construction costs.

More attention being devoted to the use of shop fabricated piping, structures, and "package" assemblies.

 A trend whereby mining companies are making more use of independent research facilities for the development of data necessary for flow sheets.

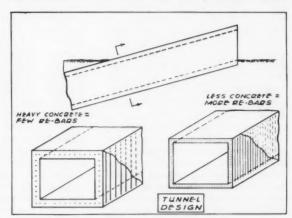
Planned computer programs have applications for these problems

The most promising computer applications in the mining and milling industry are:

- Payroll computation involving complicated bonus problems.
- 2. Cut and fill calculations for road construction.
- Open-pit operations involving survey notes, mill feed grade, and drill hole data—and this appears economical only when several open-pit mine problems are available.
- Problems of heat balances and fractional crystallization.
- 5. Process control—the leader has been the Riverside Cement Company at Oro Grande, California. The computer is used to select the most economical combination of materials from the blended stockpiles. The company is conducting data logging with a computer and intends, in the near future, to put its kilns on computer control.

Of interest to mill designers is the computer solution of a concrete tunnel design. As such tunnels come up to grade, the design loads on the tunnel constantly change with decreasing overburden.

The problem is to select the optimum design at various tunnel cross sections. Design is a function of overburden load, concrete cost, cost of steel reinforcing bars, and



labor involved in placement. When these data are properly fed to the computer, calculating time is a matter of seconds, while long hand calculating method would take days and be subject only to a limited number of analyses to approach the optimum design.

Arizona Asbestos Industry Is

The special low-iron chrysotile asbestos of Central Arizona is finding a growing market in the United States and abroad. To meet the increasing demand for their unique fibers, the asbestos producers are enlarging their capacity and stepping up mine production. In the last two years three new mills have been completed. This is a first-hand report from "Asbestos Row".

The asbestos producers of Central Arizona are successfully picking themselves up by their bootstraps after the economic doldrums they endured through 1959. Today, the stretch along Highway #70, three miles east of Globe, is known as "Asbestos Row" because of three new processing mills recently built. In the Salt River and Cherry Creek Basins to the north of Globe the asbestos mines are again producing the high grade, low-iron content ore for which they are famous.

This is in sharp contrast to the depression picture that gripped the Arizona asbestos industry after December 31, 1958 when the United States Government stopped purchases of fiber under Public Law 733. Nine companies shut down and asbestos mines and mills in Gila County were deserted. At that time, without government support there was no sale for their product since they could not compete with Canadian asbestos on the open market.

Rather than let equipment rust and their mines collapse, the aggressive leaders of the several asbestos companies sought to revive their ailing industry by looking for new markets for Arizona fibers. That they have succeeded in their efforts is amply proven by the new mills, new equipment and growing mining activity in the Central Arizona area. Further impetus was given to the industry earlier this year when the United States Government Office of Defense Mobilization

announced its intention to buy 500 tons of crude No. 1 and No. 2 asbestos from Gila County producers for the national stockpile.

Most Arizona asbestos is short fiber and powder grading through crudes No.'s 4 through 7. Only a very small amount is the longer fiber crudes No. 1, 2 and 3. However, the Gila County chrysotile is a singularly unique product. It is very low in iron content making it eminently suitable for electrical insulation uses, such as cable covers on naval vessels and in missiles. These Arizona deposits are the only low-iron chrysotile deposits known in the Western Hemisphere. Since the Canadian asbestos contains considerable magnetite it is not suitable for low-iron uses.

In the past the cheaper Canadian asbestos successfully dominated the volume markets in the textile and construction industries. As a result, the higher cost Gila County asbestos could be sold only on the basis of its low iron qualities—the principal purchaser being the United States government. Thus, when the government stopped purchases in 1958, the Arizona asbestos industry collapsed.

Not being able to compete with Canadian asbestos, the Gila County producers took advantage of the markets in Mexico where the freight rate differential was to their advantage. They also diligently sought other markets abroad where the low-iron qualities of their product was desired.

By early 1960 short fibers were being supplied to cement sheet, tile and pipe plants in Hermosillo, Mexico and Mexico City, and longer fibers were going to Germany and other European countries. To further stimulate the industry the United States government again began buying for the defense stockpile. The Arizona asbestos industry was back in business again!

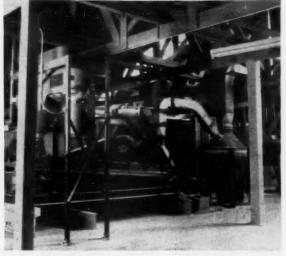
The largest asbestos companies now active in Gila County include the Metate Asbestos Corporation, Jaquays Mining Corporation, American Fiber Corporation and the Kyle Asbestos Mines of Arizona. These four companies are now employing over 100 men in their mines and mills, and are producing over 150 tons of finished asbestos fiber a week.

The Metate Asbestos Corporation, headed by Jack Neal, recently opened its \$150,000 processing mill on "Asbestos Row." This modern plant is a smaller model of two Canadian mills and has a present intake of about 7 tons an hour. It is designed to process and produce filtration fibers for the building trade. It is equipped with a 9- by 16-inch Universal jaw crusher. a two-foot Symons cone crusher, a 12by 24-inch Allis-Chalmers roll crusher, vibrating feeders, rock fiberizers, shaker screens, and a small rotary kiln for drying. At present the mill feed is coming from a small stockpile, but shortly will come direct from the recently reopened Lucky Seven and Emsco mines on the San Carlos Apache Indian Reservation north of

Growing Steadily Around Globe



AERIAL VIEW of part of "Asbestos Row." New processing plant of Metate in center with LeTourneau lower right.



INTERIOR of new \$150,000 mill of Metate Asbestos designed to handle seven tons of cobbed asbestos ore an hour.

Globe. Both mines use trackless mining and shortly expect to be shipping 15 tons a day. They are equipped with an Eimco 635 loader and two Young Ore Buggies. Now that Diesels have been approved for underground mining in Arizona, Jack Neal expects to take full advantage of them to trim

mining costs.

The Jaquays Mining Corporation built its new mill on "Asbestos Row" in 1959. This replaced their former mill on the outskirts of Globe which has been closed and will be dismantled. Their new mill has a section for initial processing of crude ore with a capacity of 2 tons per hour, and a fiberizing section with a capacity for producing 10 tons of fiberized asbestos daily. Plans are now underway to build an acid treating plant to clean the processed asbestos fibers of lime and dust. This proposed plant will treat two to four tons of fiber a day with hydrochloric acid, according to Al Gerhardt, General Manager. The higher quality, cleaner fiber will then command a much higher price on the market. The present mill is now receiving approximately 90 tons of ore a week from the Regal and Chrysotile mines, some 38 miles north of Globe. The Chrysotile mine is still being developed, but Mine Superintendent Everett Costle sends 30 tons of cobbed ore a week to Globe. Costle has 12 men developing the underground stopes in preparation for greater production to come.

Grady B. Gulledge, Vice President

and General Manager of the American Fiber Corporation reports that he has 36 men producing 250 tons of ore a week from four open-pit and underground mines in the Young area. The Rockhouse, Montezuma, Wolf Springs and Atlas mines ship ore to the American Fiber mill at Young where 50 tons of processed fiber are produced each week.

Underground and open pit work are continuing at the Sloan Creek and Lucky Strike mines of the Kyle Asbestos Mines of Arizona. Roger Q. Kyle, who has been in the asbestos business longer than any of the other Gila County men, has his mill at Young and expects to enlarge facilities shortly.

The LeTourneau Asbestos Corporation, also operating in the Young area, is now developing and building a new processing plant on "Asbestos Row." They will eventually be getting their ore from the LeTourneau mine which is now inactive.

The Arizona asbestos producers are competing against the large tonnage, low cost Canadian companies, as well as African mines also supplying the special low-iron chrysotile. As a result the Gila County producers are extremely cost conscious.

Mining the asbestos veins in the Salt River and Cherry Creek Basins north of Globe is costly. The veins pinch and swell irregularly and are so erratic in size and direction that development cannot be planned as definitely as in the mining of many other

minerals. As a result none of the producers are mining asbestos today for less than \$40 a ton. However, now that the use of underground Diesel engines is permitted in Arizona, it is estimated that mining costs could drop to \$30-\$35 a ton. This is a picture the producers like very much and they intend to take full advantage of it. Diesel equipment is planned for at least four mines.

To further cut costs and improve fiber-refining methods, Ed Town of "Asbestos Row" has patented a new machine that refines asbestos fibers through a combination of water, acid, and air pressure for fiber separation, and a unique "finger-lift" means for more efficient grading. Ed Town attributes many economies to the new machine besides its unique method of gentle fiber separation.

Milling and processing the cobbed asbestos ore close to Globe rather than at the mines was also done for expediency and economy. An abundance of water, a ready labor market, and railroad shipping facilities make the location of the new mills on "Asbestos Row" a logical choice.

The Arizona asbestos industry has indeed picked itself up by its bootstraps through aggressive selling techniques and a diligent search for new markets. It is expected that the coming months will see increases in production and the opening of new mines, since, as Jack Neal of Metate says: 'Asbestos has the brightest future of the non-metallics."



The new Minister of Mines, M. Ed. Rudahindwa, drawn from the department's office staff at Bukavu, speaks hopefully of expansion in gold and tin in the northeast; of copper in the lower Congo, and of oil prospecting results near the Congo River mouth. We cannot guess what machinery he will have to speed the good work. He has lost the chief director of the Mining Service, A. Vaes, whose annual reports on the Congo mining industry have been our chief source of light; also L. de Paeuw, chief engineer, and G. Delville, chief sectional engineer. Engineer Paul Dupont—with family in Belgium—alone remains at Leopoldville headquarters.

The disappearance of the professional classes from the western Congo is more likely to be complete than that of the commercial. Neither at the Lovanium (Leopoldville) or the Elisabethville University can an advanced student be found, qualifying for the profession of mining engineer, extractive metallurgist, or geologist.

Congo Mines Lose Little Production

reports special African contributor in Elisabethville

It was not all peace and quiet in the new Congo Republic as independence was granted. MINING WORLD's special African contributor cables as follows: "On July 6 troop mutinies started and until the Belgian commandos arrived, chaos was complete. Of this your correspondent can permit no doubt." He was himself, on July 13, maltreated and held hostage by frenzied soldiers, armed with rifles and fixed bayonets, under threats of death should one Congolese soldier be killed by the invading Belgian paratroopers.

Any full discussion of the Congo's mining prospects under the new regime would be wildly premature today. The political situation is too confused-confidence in future stability too deeply shaken. The prophets are polishing their crystal balls for another look; maybe some form of copper crystal will be needed for the clearest view. The one unalterable and predominant factor in the shaping of the country's destiny will be its mineral wealth. Mining created Katanga Province and Katanga created the Congo. And now, only Katanga continuing to operate smoothly under its enlightened control can save the country from economic collapse.

"UNION MINIÈRE du HAUT KATANGA got through the crisis well," was his report after a full onthe-scene inspection of the vast mining and metallurgical plants. "Operations are going full blast," he cables, "with only four percent of European absentees, after families had been

gotten away. Lost hours were insignificant, and damage to industrial assets was nil. July 10 and 11 were the two blackest days, notably at Jadotville, Elisabethville, Shinkolobwe, and the power stations, where the mutinous troops were stationed.

"One can view the immediate future of Union Minière, safely shipping copper through the Portugese African Ports of Beira and Lobito, without misgivings. If and when the Belgian troops are withdrawn, grave anxieties would return. Today progress is normal. Construction at the Luilu electrolytic plant toward the designed capacity of 100,000 annual tons of copper, and at the Kambove concentrator, continues up to schedule.

"The incline skipway at the Kolwezi mine itself has been in trouble with unstable foundations, but the open pit is now in excellent shape for big ore tonnages after a long session of overburden removal.

"Transition to underground mining at Kambove and Kamoto is a matter of years. See MINING WORLD, September 1959, pages 70 and 71 for full details. At Kamoto, the first circular shaft, for ventilation, has been stopped. A station has been cut at the 1,100 foot level and cross-cutting started toward the ore body. A second shaft, 150 feet distant, is to be sunk for hoisting of ore.

"FAMED SHINKOLOBWE, once the world's largest and highest grade uranium and radium mine, and cosupplier with the Colorado Plateau of the uranium for the first Atomic Bombs comes to an end. "Next year, upon the final cleanup of surface stocks, Shinkolobwe will be dead. This mine stands unique—mineralogically, without all doubt, and economically, maybe. At no time, during its life of 30 years—the actuary's delight—have stockholders known the profits earned. Vaguely conscious of the mine's spectacular richness, they were, as model members, well content.

"If Katanga, as an independent state or province under African rule, can maintain its friendly alliance with Belgium, all will go well. The men of the mining world, administrative as well as technical, will stay. Without that backing, without the sense of stability, security, and optimism it alone can bring, great will be the exodus.



KAMOTO MINE'S exploration shaft: new ore hoisting shaft will be sunk 150 feet away.

Metal & Mineral Prices

U.S.A.

METALS

August 19, 1960

COPPER: Electrolytic. Delivered F.o.b. cars, Valley basis (pound) 33.00c Lake. Delivered, destinations, USA 33.00c	
Foreign Delivered, destinations, USA 33.00¢ LEAD: Common Grade. New York (Per pound) 12.00¢	
Tri-State Concentrate, 80% lead, per ton	
ZINC: Prime Western: F.o.b, E. St. Louis (Per pound) 13.00¢ Prime Western: Delivered New York	
Tri-State Concentrate, 60% zinc per ton	
ANTIMONY: Lone Star Brand, F.o.b. Laredo, in bulk (Per pound) 29.50¢	
BISMUTH: (In ton lots) price per pound \$2.25 CADMIUM: Sticks and bers, 1 to 5 ton lots Price per pound \$1.50 COBALT: 97-9996, keg of 500 pounds (Price per pound) \$1.50	
COLUMBIUM: Ingot Nom., per pound \$55.00-\$85.00	
LITHIUM: 98% (per pound)	
MERCURY: Flasks. Small lots, New York \$209.00-\$212.00 NICKEL: "F" Ingots (5 pounds). F.o.b. Port Colbourne, Ontario 75.50¢	
PLUTONIUM: To July 1 1962 AEC will pay \$30.00 to \$40.00	
per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	
SELENIUM: 99.5% per pound \$7.00 TELLURIUM: Common grade, Per pound \$3.50	
THORIUM: per kilogram 543.00 TIN: Grade A Brands. New York (Per pound) Prompt delivery 102.375¢ TITANIUM: 99.3% + Grade A-1 Sponge (Per pound) \$1.50.\$1.60	
URANIUM: Rod (0.790 U-235) \$16.00 Per Pound: Foil \$16.75	
U-235: Nominal (Per pound)	
SILVER: Newly mined domestic. U.S. Treasury price per ounce 90.56 Foreign Handy Harmon 913/6	
PLATINUM: Per ounce \$82.00-\$85.00 ZIRCONIUM: Sponge, Per pound, Reactor Grade \$5.00	

ORES AND CONCENTRATES

BERYLLIUM ORE: 10 to 12% BeO. F.o.b. mine, Colorado \$46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and
Franklin, N. H. Visual inspection at \$400.00 per short ton
or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to
9.9%, \$45; over 10.0%, \$48.00.

CHRUME UKE: F.O.D. railroad cars eastern seaports. Dry long to	
African (Rhodesian). 48% Cr2O3. 3 to 1 Ratio \$35.00	-\$36.00
African (Transvaal), 48% Cr2O3, No ratio \$26.00	
Turkish, 48% Cr203. 3 to 1 chrome-iron ratio Nominal \$36.00	-\$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buyi	ng sus-
pended, quota filled.	
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal	\$1.10
IRON ORE: Lake Superior. Per gross ton Lower Lake Ports	
Mesabi, Non Bessemer, \$1.5% Fe	\$11.45

Mesabi, Bessemer, 51.5% F													\$11.60
Old Range Non Bessemer													
Old Range Bessemer													
Lump: Plus 1/2-inch													
Fines: Minus 1/2-inch													\$10.72
Swedish, Atlantic Ports, 60	to	68	%	Fe	Co	ntro	act	5,	Per				
Unit										. '	24	.00	-25.00€
MANGANESE ORE: Metallurgic	les	gre	ade.	. 4	B to	5	0%	. 1	An.	L	ore	2	
ton unit											S	0.9	5-\$1.00

Metallurgical grade. 46 to 48% Mn. Long ton unit \$0.90-\$0.95
Metallurgical grade. 46 to 48% Mn. Long ton unit \$0.85-\$0.90-\$0.95
Metallurgical grade. 44 to 45% Mn. Long ton unit \$0.85-\$0.90
Domestie U.S. Government. GSA Basis \$2.30 per unit for 48% Mn.
MOLYBDENITE CONCENTRATE: 90% MoSe F.o.b. Climax, Colorado. Per
pound Mo, plus container cost
TUNGSTEN CONCENTRATE: Domestie. 60% WOa Per short

TUNGSTEN CONCENTRATE: **Domestic.** 60% WOs Per short ton unit ton unit ton unit \$24.00 Foreign: 65% WOs Per short ton unit (Scheelite) . Nominal \$20.05 Foreign: South American, Spanish, Portuguese . . Nominal \$20.00 URANIUM ORE. F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of UsOs in ore assaying 0.10 percent. For each additional 0.01 add 20%. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

HOIT-METALLIC MINTERALS	
BARITE: Oil well drilling. Minimum 4.25 specific gravity,	
per short ton	ì
BENTONITE: Minus-200mesh. F.o.b. Wyoming. Per ton, car-	
load lots	į
Oil Well grade. Packed in 100 pound paper bags \$14.00	j.
BORON: technical grade . F.o.b. Boron California, Per ton . \$47.50)
FLUORSPAR: Metallurgical grade. 72.5% effective CaF2 content	
per short ton F.o.b. Illinois-Kentucky mines \$37.00-\$41.00)
Mexican. 70% F.o.b. border \$28.00-\$29.00	
Acid Grade. 97% CaF: Bulk, F.o.b. mine \$45.00-\$49.00	ì
PERLITE: Crude: F.o.b. mine per short ton \$3.00 to \$5.00	j
Plaster grades. Crushed and sized. F.o.b. plants \$7.00 to \$9.00	j
SIII PHILIP: Long ton Fah Hoskins Mound Texas \$22.50.\$22.50	

London

	August 19, 1960	
	Per Long Ton USA Equivalent cents per pound*	
COPPER:	Electrolytic spot £240 10s 0d 30.06¢	
LEAD:	Refined, 99% £ 70 5s 0d 8.786	
ZINC:	Virgin 98% £ 87 Os Od 10.88¢	
ALUMINUM:	Ingot, 99.5% £186 0s 0d 23.25¢	
ANTIMONY:	Regulus, 99.0% £197 10s 0d 24.69c	
TIN:	Standard, 99.75% £796 Os Od 99.50e	
TUNGSTEN:	Long ton unit 159s \$22.40e	
	*With Sterling Pound at \$ 2.80	

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N. Y.

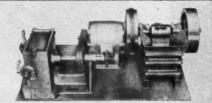
CRUSHERS and PULVERIZERS in stock now for PROMPT SHIPMENT



21/4" x 31/2" Jaw Crusher for hand or power drive



5" x 6" Jaw Crusher, capacity 2000 lbs. per hour



4" x 6" Jaw Crusher in combination with 8" disc pulverizer

Crushers employ the top (overhead) eccentric principle of operation. Only one toggle is used with simple handwheel adjustment for regulating spacing of jaws to size of product. Common base for crusher and motor can be supplied.

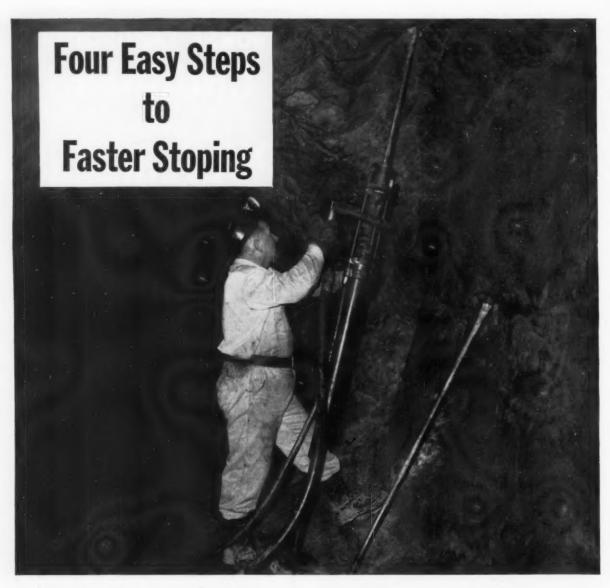
8" disc pulverizers have special alloy grinding discs for crushing to 100 mesh. Smooth interior and elimination of pockets simplifies your cleaning.

(B)

For complete specifications and prices on these items and other laboratory machinery write for BULLETIN 576A.

MORSE BROS.

Established in 1898 to serve the mining industry
2900 BRIGHTON BLVD DENVER, COLORADO



1.	Choose the drill size you need	Gardner-Denver Model Hammer diameter	R68 2%	RB94*	RB104*
		Direct feed (steel)	Х	Х	X
2	Take your choice	Direct feed (aluminum)	X	X	X
۷.	of feeds	Telescopic direct (aluminum)	X	X	X
	71.17-70	Reverse feed	-	X	X
2	Specify the chuck	Collared chuck	X	X	X
J.	to match your steel	Tappet chuck	X	X	X
A	Add the time of	Push-button control	Х	X	X
4	Add the type of	Rotary control	X	X	-
	controls you prefer	Stop rotation control	-	X	X

Gardner-Denver stopers hit hard, are easy to handle, stay on the job with minimum maintenance. All have automatic water control—operate in "water on, air on . . . air off, water off" drilling cycle. Ask your Gardner-Denver mining equipment specialist for details. Write for bulletin.

*Roof-pinning models available-drill holes, drive stude and tighten nuts quickly, efficiently.



EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

International Division, 233 Broadway, New York 7, New York

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Eighteen convenient smelters and refineries

ASARCO: Buyer, smelter, refiner of gold, silver, lead, copper and zinc ores and blister copper, concentrates, mattes and residues. Fifteen domestic and three Mexican plants located for maximum accessibility as follows:

LEAD SMELTERS

Selby, California Leadville, Colorado East Helena, Montana El Paso, Texas Chihuahua, Chih., Mexico

ZINC SMELTERS

Amarillo, Texas Corpus Christi, Texas

COPPER SMELTERS

Hayden, Arizona El Paso, Texas Tacoma, Washington San Luis Potosi, S.L.P., Mexico

LEAD REFINERIES

Selby, California Omaha, Nebraska Perth Amboy, New Jersey Monterrey, N.L., Mexico

COPPER REFINERIES

Baltimore, Maryland Perth Amboy, New Jersey Tacoma, Washington

For additional information, write to the plant nearest you or to: American Smelting and Refining Company, Ore Purchasing Department, 120 Broadway, New York 5, N. Y

All Teeth Stay Sharper, Last Longer with



ROAD RIPPER TEETH averaged 7 to 10 times more life after receiving protection with Tube Borium. Notice how tooth chisels down with wear.



SHOVEL TEETH wore out in one 8-hour shift. A few beads of Tube Borium applied during noon break prolong life 6 or 8 full shifts. They are then repointed and hard-faced for further use.

TUBE BORIUM is available in stick form for oxyacetylene or manual electric application. Also in continuous wires for automatic and semi-automatic electric application. Various mesh sizes for individual uses.

STOODY COMPANY

11932 East Slauson Avenue . Whittier, California

Stoody TUBE BORIUM!

Wear and loss of digging efficiency are common complaints on all types of teeth—ditchers, power shovels, rippers, draglines, dredges, etc. Hard-facing greatly prolongs useful life. But even so, each tooth can be made to last far longer than ever before and retain its sharpness by hard-facing with Stoody TUBE BORIUM!

Why is this one hard-facing alloy so superior on teeth? No other hard metal equals TUBE BORIUM in straight abrasion resistance. Its deposits are thickly peppered with tiny tungsten carbide particles. Wear is virtually defied by this hardest-of all man-made metals.

More expensive in first cost, Tube Borium shows excellent economy in overall service life, outlasting other materials many times over. And longevity is not your only benefit. Remember, one major cost of any hard-facing application is welding time. Use the best, Tube Borium, and you'll save several applications of less effective alloys besides eliminating needless downtime! Your Stoody dealer (check the Yellow Pages of your phone book) will supply details, literature or recommendations. Ask about Tube Borium—or write direct.



DRAG LINE TEETH used in slag dump were hard-faced with Electric Tube Borium—outlasted unprotected teeth 9 to 12 times.

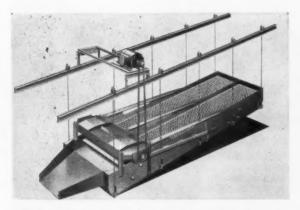


DITCHER TEETH—A few ounces of 30-40 Electric Tube Borium on points of teeth increased life 6 to 8 times over factory originals.

BOOTH 202-206 A.M.C. LAS VEGAS OCT. 10-13

PRODUCTION EQUIPMENT preview

FOR DATA ON ANY ITEM IN THIS SECTION PLEASE USE PINK INQUIRY CARD OPPOSITE PAGE 52



Shaker Screen with Integrated Drive

The trend to compact design with increased capacity features a new shaker screen manufactured by Fairmont Machinery Company of Fairmont, West Virginia.

The screen is used for coal, ores, crushed stone and other bulk solids. Drive mechanism of the new shaker screen is an enclosed self-contained unit with forced lubrication and all anti-friction bearings. Units are furnished with the desired stroke and speed ranging from ½ inch at 1000 rpm to 5 inches at 165 rpm. Speed and stroke can be adjusted and varied. Power is supplied by a 3-phase induction motor. Circle No. 96.



New 15-Ton Getman Ore Carrier

The above picture shows the new Getman Model KD-5A, developed and manufactured by the Getman Brothers of South Haven, Michigan. This new Getman Ore Carrier is equipped with the V-6 Deutz engine developing 115 horsepower. It has a carrying capacity of from 12 to 15 tons, and is equipped with exhaust gas filtering and diffusion system for underground mining. This new KD-5A has automatic transmission with three speeds forward and three reverse; air brakes; special heavy-duty mine cushion tires; hydraulic power steering and hydraulic controlled dump body. Circle No. 97.

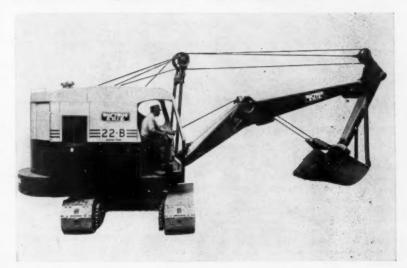
Improved Features of Crane-Excavator Designed to Cut Operating Costs

Bucyrus-Erie Company has announced the 22-B Series Two crane-excavator with new and improved features designed to cut operating costs and boost production. It is available as a crawler, carrier or wagon mounted machine, fully convertible for crane, dragline, clamshell, hoe, or shovel service.

Longer machine life, trouble free operation, and minimum upkeep are advantages effected through such new features as: adjustable hook rollers; splined horizontal propel shaft; alloy bronze bearing for propel machinery; splined clutch for quick shift swing-propel; surface hardened gear teeth; remote control lubrication of swing gear and pinion; improved swing clutch bearing seals; and improved crawler frame construction with shielded rollers and bearings.

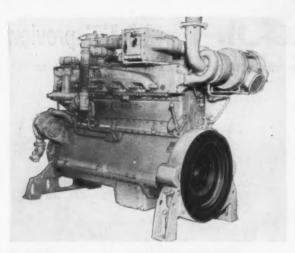
Faster, smoother operation and increased production are achieved through refined brake-cam action and larger capacity of boom hoist; full wrap main brakes; three tooth, twin spring house lock; improved propel and crowd chain sprocket teeth; friction type governor control; larger capacity drums; and optional twin governor dual control of torque converter speed and power combinations.

On the 25-ton capacity Transit Ma-



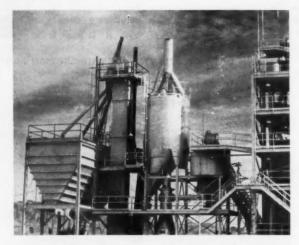
chine, additional new features include: high strength alloy steel booms up to 110 feet long with bolt or pin connections, 12-part suspension with anti-friction bearing-mounted sheaves, choice of 6x4, 6x6 or 8x4 carriers with gas or diesel power; removable rear outriggers

plus optional aluminum floats for jack screws on outrigger beams; heavier, stronger A-frame; power load lowering, and eight conical hook rollers. Hydraulic outriggers with both horizontal and vertical movement are available. Circle No. 30.



Lowest Cost Natural Gas Engine

The Caterpillar G342 reportedly has the lowest initial cost per BHP-HR, and the lowest operating cost of all natural gas engines in its horsepower class. It is rated at 280 horsepower or 175 KW for continuous operation. Records show fuel consumption at the rate of approximately 7,000 BTU (low heat value) per brake horsepower hour. Tests conducted by Caterpillar show that by Turbocharging and aftercooling these units the fuel consumption is even less, Circle No. 66.



Parry Gypsum Dryer Handles 80 TPH

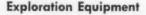
After considerable test work, Fibreboard Paper Products Corporation installed a Parry Gypsum Dryer at their new gypsum washing plant near Las Vegas, Nevada. Designed to dry 80 tons per hour of gypsum, %-inch x 65 mesh, from seven percent surface moisture to one percent, this dryer was engineered and built by the Silver Engineering Works, Inc. of Denver. Colo. The feed rate to dryer is remotely controlled and stack gases are used to temper furnace gases through recycle blower. Circle No. 98.



Scalping-Classifying Tank

Western Titanium N.L., Capel, Western Australia, employs a double 24-foot Water Scalping-Classifying Tank with power-operated bleeder valves manufactured by the Eagle Iron Works of Des Moines, Iowa.

This tank has two-cell splitters and a collecting-blending flume for classification and removal of excess water from ore bearing beach sands being processed. The sand is pumped to a tronumel screen for removal of overside and roots. Underflow goes to the Eagle tank and from there to a constant density vessel from where it is pumped to the feed end of Humphrey Spirals for recovery of the titanium. The product of the first several valves goes to a wet screen where plus 20 mesh material is removed. Circle No. 64.



The Swedish Diamond Rock Drilling Company of Stockholm, and its subsidiaries the Craelius Organization and the ABEM Company, are the largest manufacturing company of diamond core drills and equipment in Europe. They also manufacture geophysical equipment including the Craelius Dip Indicator which can measure the inclination and direction of diamond drill holes down to 3,000 feet, a core orientator, and soil samplers. The company has played a leading role in the development of geophysical exploration methods and equipment, and has carried out extensive contract geophysical prospecting without interruption since 1923. Their airborne electromagnetic prospecting system has been used to carry out surveys in eight countries in Europe and Africa, Circle No. 93.



Improved Surveying Instrument

The Geodimeter Company announces its newest electronic distance measuring equipment Model 4B. The device offers users important advantages over previous models including an improved reading dial, a course site included within the instrument reducing pointing time at least 25 percent, and weight reduction of 20 percent. Circle No. 41.



Small Portable Magnetometer

Holger Jalander, a Finnish Geophysicist, has developed a portable magnetometer which is reported to have proved very effective in the studies of iron formations conducted by the U. S. Geological Survey in Michigan.

Known as the Jalander Electronic Magnetometer, Model 1957, this instrument measures ten inches in length by three inches in diameter and weighs three pounds. Principle features include a fluxgate and an oil damped magnetic transducer which levels itself automatically in the vertical direction for measurement of the vertical magnetic field. The electronic part is transistorized and fed by four standard 3-volt flashlight batteries, Range of the instrument is 10 to 250,000 gammas. Five sensitivity ranges are selected by a swift movement of the hand. Readings are obtained at the touch of a push button in a matter of seconds. Instrument is designed for both ground and airborne surveys, Circle No. 59.

MORE NEW EQUIPMENT .. AND NEW LITERATURE

STAINLESS STEEL is the subject of a 164-page volume "The Fabricator's Handbook" issued by the Crucible Steel Company of America. Complete fabrication and design data are included. Circle No. 20.

PORTABLE BELT CONVEYORS now available in 18, 24, 30 and 36-inch belt widths and in lengths of 69, 75 and 81 feet has just been announced by Barber Greene Company. Circle No. 21.

PRECIOUS METALS for industrial applications are described in a recent brochure by Texas Instruments Inc. Gold, silver, and platinum (solid or clad) strip, tubing, wire and other products are detailed. Circle No. 22.

INDUSTRIAL TRACTORS and equipment are the subject of a 6-page brochure describing tractor shovels, bull-dozers, loaders and allied equipment manufactured by j. 1. Case Company. Circle No. 23.

ENCINEER'S TRANSIT features securely sealed, permanently lubricated ball bearing construction for high accuracy under all climatic conditions. This is the Brunson Model 50 distributed by Charles Bruning Company, Inc. Circle No. 24.

METERS, FEEDERS & CONTROLS are described in a new 8-page general bulletin just published by B-I-F Industries of Rhode Island, Circle No. 25.

SUCCESSFUL MINING is the title of a new 8-page, 2-color booklet offered by the Caterpillar Tractor Company. Efficient, profitable mine techniques and operations are described: Carcle No. 26.

DIAMOND BITS AND CORE BAR-RELS are the subject of a 28-page bulletin available from Acker Drill Company. This illustrated bulletin describes their complete line of diamond bits, core burrels, rotary rock bits and drag type bits. Circle No. 39.

List information
you want MINING
WORLD to obtain for
you on this card. WE'LL
DO THE REST. No
postage necessary
if mailed in U. S.

FOOTWEAR: A new catalog from the B. F. Goodrich Footwear Company offers readers a complete gaste to the correct selection of footwear for industrial needs. Carele No. 33.

SHEAVE BLOCKS that are quick opening and made of forged alloy steel are described in Bulletin 287-8 by the Joy Manufacturing Company. Circle No. 36.

CRUSHERS of all types made for primary, secondary or fine reductions are described in Bulletin No. 1126 by the Traylor Engineering and Manufacturing Company. To receive a free copy circle No. 37.

COST & PRODUCTION estimating book that is an authentic and complete guide for estimating material-moving costs, and for selecting equipment combinations is now being mailed free by International Construction Equipment, Circle No. 38.

MOTOR GENERATORS: A new line of special application generators and motor generators available in ratings from 5 KW thru 100 KW has been announced by The Lima Electric Motor Company. Circle No. 40.

% YARD SHOVEL: The crawler mounted Lorain Model 26 is described in a new 20-page catalog just released by the Thew Shovel Company. Booklet gives details of machine's construction and job applications for use as shovel, crane, clamshell, dragline, hoe, log loader, pile driver and magnet. Circle No. 42.

VARIABLE SPEED DRIVES with constant horsepower designed to meet capacities up to 50 horsepower and ratios up to 5.5:1 are detailed in a new folder by the Link Belt Company. Circle No. 43.

SHEAVE BLOCKS that are sturdy, dependable, and of high quality with new design features found in no other block are described in Bulletin No. 292 by the Alloy Steel & Metals Company. These quick opening blocks are available in 8" and 10" sizes, Circle No. 44.

NEW PLATE MAGNETS have recently been announced by the Eriez Manufacturing, Company. This new line of general-purpose plate magnets promises to be the answer to many common but stubborn problems involving all types of trainp iron and line iron contamination. Circle No.

VIBRATING SCREENS are now available in three new sizes according to the Universal Engineering Corporation. The Universal Screens, now include sizes 5' x 12', 5' x 14', and 5' x 16'. Circle No. 46.

ELECTRONIC DRIVES are described in a recently released Bulletin #101 by the Louis Allis Company. Scheet-A-Spede drives range in size from \$ HP to 4 HP, and leature a D.C. motor powered from a compact, wall mounted electronic control panel. Circle No. 47.

SCALES for ore weighing with capacities up to 100 tons, with platforms up to 80 feet long and 14 feet wide, are now being manufactured by The Cardinal Scale Company, Circle No. 52.

V-DRIVES and conveyor belting are the subjects of two new catalogs published by Turner Brothers Ashestos Company of England. Both catalogs deal with engineering data, specifications, operation and maintenance of these Turner products. Circle No. 56.

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BELT CONVEYOR IDLERS are described in a new 44-page catalog by Barber Greene Company. The new catalog thoroughly covers idler application, and describes and illustrates the more than 800 units in the complete line. Circle No. 1.

A C MOTOR catalog is available free from Sterling Electric Motors. This illustrated 56-page publication includes complete pricing and dimensional data on A C Multi-Shielded motors ranging from % to 200 horsepower. Circle No. 2.

X-RAY ANALYSIS by a new machine that gives fast, economical analysis of nearly all elements is announced by Applied Research Laboratories, Inc. This new analyzer has many features not previously available in spectrochemical equipment. Circle No. 3.

ELECTRON BEAM WELDING technique is described in a new 12-page catalog just released by Air Reduction Company. New method welds by direct bombardment of highly accelerated electrons in vacuum chamber metals and alloys difficult or impossible to weld with conventional techniques. Circle No. 4.

CONVEYOR LUBRICATOR that automatically injects oil or grease in wheel bearings in trucks, dollies and pallets used with floor conveyors is available from Oisen Manufacturing Company. This is the new floor-type, heavy duty model No. 152. Circle No. 5.

NEW CORE DRILL has a capacity of 4,500 feet using AX (2 inch) bits and features a hydraulic drill head and a new patented automatic chuck. Made by Acker Drill Co., the Presidente drill has a power operated air brake and clutch. The unit can be skid or track mounted. Circle No. 15.

DUST SEPARATORS are detailed in Bulletin D-20 released by the Day Company. This new 8-page bulletin includes performance data, installation photos, selection and dimension charts for Dual-Clones and Dual-Clone supports. Circle No. 6.

FLOTATION REAGENTS are the subject of technical notes prepared by the American Cyanamid Company. This comprehensive booklet should be added to the files of all metallurgists. Circle No. 7.

FREE ILLUSTRATED brochure titled "Drilling Rock With Coupled Steels", details proper operational and maintenance procedures for coupled rock drill steels, is now available from Thor Power Tool Company. Circle No. 8.

DRY PROCESSING is the subject of the new catalog just issued by Sturtevant Mill Company. This 8-page edition describes a full line of dry processing equipment. Circle No. 9.

NEW GEAR DRIVE arrangement for grinding mills has been announced by Allis-Chalmers. The Twinducer drive efficiently harnesses the power of two synchronous motors located on the mill side of the drive. Circle No. 10.

CARBIDE INSERT BITS that offer maximum efficiency with the Mole-Dril are now offered by Gardner-Denver, Circle No. 11.

NEW COMPRESSOR catalog from Allis-Chalmers is said to be the most complete catalog ever offered covering performances and engineering data on singlestage centrifugal compressors for air application, Circle No. 12.

BRAZING TECHNIQUES are detailed in a new 24-page illustrated manual offered free by the All-State Welding Alloys Company, Inc. of White Plains, New York. Circle No. 13.

EXTENSIVE FACILITIES of the Rocky Mountain Export Company in "packaging" hundreds of items of construction and geophysical equipment are described in their new 16-page Product Directory. Circle No. 14.

CESIUM is the title of an illustrated 16page booklet just published by Chemalloy Minerals Ltd. of Toronto. This free book describes the uses, geology and mineralogy, metallurgy, research and outlook of this wonder metal of the space age. Circle No. 16.

SMOKE EJECTION: A complete handbook on the principles and operational procedures of eliminating smoke from confined areas in event of fire or emergencies is now available free from the Super Vacuum Manufacturing of Denver. Circle No. 17.

CRAWLER-TRACTOR: The Eimco Corporation has published a comprehensive 32-page book on their recently introduced 100 hp Diesel Eimco 103 crawler-tractor line. Pages are profusely illustrated with features and specifications of this tractor series. Circle No. 18.

FURNACES for roasting, calcining, drying and incinerating ores, sludges, chemicals, and organic materials are designed and built to your exact requirements by Pacific Foundry and Metallurgy Company. For information circle No. 50,

DRILL STEEL treated with the exclusive Sandvik process is protected against corresion and provides from 30 to 50 percent longer life than untreated steel according to Atlas Copco. Circle No. 51.

INDUSTRIAL PUMPS are described in the latest free catalog issued by John Bean. High pressure reciprocating pumps with capacities from 0.5 to 100 gpm and pressures from 100 to 12,000 psi are detailed. Circle No. 55.

REPEATING TRANSIT which combines speed, accuracy and ease of operation plus the convenience of extra speed of automatic collimation setting is available in the Wild T-1A model by the Wild Heerbrugg Instruments Co. Circle No. 53.

SHEAVE BLOCKS: Quick opening blocks of forged alloy steel are described in Bulletin 287-8 by the Joy Manufacturing Company. Circle No. 54.





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ROTA - BLAST RG-2JS For extremely hard abrasive rock (Taconite, quartzite)



ROTA - BLAST For hard rock (Siliceous limestone, dolomite, sandstone, granite)



ROTA-BLAST OW For medium rock (Limestone, sandstone, sandy shales)



ROTA - BLAST OSC-1G For soft formations (Calcite, shale, clay)

Working closely with both operators and drill manufacturers, Hughes rotary rock bit specialists have developed drilling practices that have increased footage per bit and penetration rate by as much as 100% in some areas. For instance, in parts of the Mesabi Iron Range, Hughes bits and rotary drilling techniques contributed greatly to making the production of lower grade ore economically feasible.

Your Hughes "Rota-Blast" rock bit representative is qualified to work with you in determining the rotary speed, air pressure and volume, load on bit, and bit type to most economically drill your blast-holes. Behind his recommendations and behind every Hughes "Rota-Blast" bit are the world's largest rock bit research laboratory and manufacturing plant.

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on all projects involving mining of materials and their transportation. We design complete surface and underground mining schemes and the necessary mechanical equipment based on the manifold experiences of our mining, excavation and conveyor engineers.

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manufacture and erect excavators, either rail or crawler mounted, for mining, canal and dam construction, etc., such as bucket chain excavators, bucket wheel excavators, loaders, spreaders, stackers, special equipment, complete bunkering plants, conveyor bridges, stationary and movable conveyors.



Output: up to 470 cu.yds/hr.

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We are exhibiting this type of bucket wheel excavator at the 1980 Mining Show, held by the American Mining Congress at Las Vegas, Nevada, October 10—13, 1960. It can be seen on Spaces No. 45, 72, 74, and 76 in the Qutside Exhibit Area.

■ Large KRUPP Bucket Wheel Excavator,

with loading unit mounted on separate crawler tracks.
Daily output rate: 200,000 cu.yds.
Maximum cutting height: 164 feet above track level
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precipitates—CENTRAL AND EASTERN-

Copper Range To Develop Michigan Copper Deposit

Copper Range Company is undertaking a \$2,000,000 development of a recently located copper ore body in Michigan's Upper Peninsula. A contract has been awarded to Boland Development, Ltd. of Toronto for sinking of the mine shaft.

The ore body is reported to be about 2,000 feet beneath the surface, and about two miles southwest of the firm's White Pine mine. Diamond drilling has indicated that the same type of ore and mining conditions apparently exist as in the White Pine. Further mining and metallurgical tests will be made when the shaft is completed in the fall of 1961. White Pine mill and smelter facilities would be used to process the ore from the new mine if the company decided to proceed with the operation.



Operations at the big Viburnum, Missouri, project of St. Joseph Lead Company began in mid-July, with 3,000 tons daily as the expected amount to be milled. Expected lead recovery is about three percent. There is a little copper in the ore and, according to a St. Joe official, the company has left space so that a copper circuit can be built into the Viburnum mill at a later date if needed. In the thriving small community of Viburnum construction of business and residential buildings continues. The town's school is a gift from St. Joseph Lead Company.

If mining and mill costs for fluorspar at the Rosiclare, Illinois, operation cannot be reduced sufficiently to make prices competitive with Mexican fluorspar, the Aluminum Company of America plant there will be closed within three years. Although no definite decision has yet been made, the company's mines in Hardin county may have to close in about 30 months, and the plant later.

The General Services Administration has announced that it will sell the mineral, oil and gas rights under 2,115.63 acres of land at the former Southwest Proving Grounds near Hope, Arkansas. This tract was purchased and utilized for the testing of various types of explosives during World War II.

Drilling operations were begun recently on property about 10 miles south of Granby, Missouri and 10 miles east of Neosho. Earl Vaught of Baxter Springs is operator of a drill rig on the Edward Greenfield farm where ore was located last year while the owner was drilling for water. The present hole was expected to go to 185 feet. The Granby area was the site of a rich ore field mined in the late 1800's. Most of the mines were shallow, but a few deep shafts were sunk and rich deposits of lead and zinc were mined for several years. The Eagle-Picher Company has reportedly leased property in the area, but officials said they were not involved in the present drilling.

Iron ore shipments from the West Plains, Missouri, area totalled 640 carbloads bringing in some \$192,000 for the first half of this year. A low ebb has been hit since July, however, probably because steel plants require a higher quality ore than can currently be shipped from the area. Heavy media processing plants being installed in the area are expected to improve the situation.



New Jersey Zinc Company is using a surface diamond drill in attempts to increase ore reserves at its Jefferson City, Tennessee, zinc mine. Joy Manufacturing Company's drilling division is operating the drill on a two-shift basis.

Construction of a spur track onto the site of Foote Mineral Company's electrolytic manganese plant near Johnsonville, Tennessee was started in July. The first unit of the plant will go on stream in late 1961.

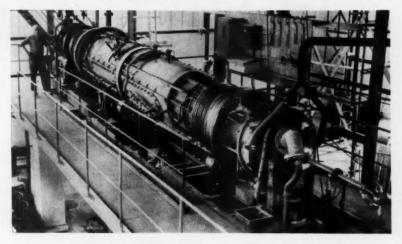
Start of production is scheduled in September for the new \$1,000,000 flotation plant built by the Feldspar Corporation in Middletown, Connecticut. At the nearby mine which will supply the plant the overburden was stripped and 2,000 tons were blasted during the sum-

mer for metallurgical sampling purposes. Pilot plant samples of the products were available this summer and large mill run samples from the new plant may be obtained when operation starts.

Tri-State Zinc Inc. is presently operating five diamond drills, double shift, to confirm tonnage and grade of ore reserves indicated in the New Market Tennessee area it is developing as a joint venture with American Zinc, Lead and Smelting Company. The drilling program will probably require six to eight months to complete.

The United States Tariff Commission has set a new date, October 18, 1960, for the public hearing in connection with investigation under section 7 of the Trade Agreements Extension Act of 1951, as amended, relating to iron ore, including manganiferous ore. Originally set for October 11, the hearing will be held in the Hearing Room, Tariff Commission Building, 8th and E Streets, N. W., Washington, D. C. Those who wish to appear and to be heard at the 10 a.m. session should notify the secretary of the commission, in writing, at least five days ahead of the date set.

Expansion of facilities that will increase triple superphosphate production by 25 percent has been commenced by American Cyanamid Company at Brewster, Florida. The project includes expansion of sulfuric and phosphoric acid capacities and additional shipping facilities.



Dravo-Lurgi Reduction Kilns at Mesabi Pilot Plants

Two Mesabi Range pilot plants being built to process non-magnetic semi-taconite will use Dravo-Lurgi magnetizing roasting kilns similar to this one-half-ton-an-hour test model. Tests are to be made at the pilot plants of M. A. Hanna Company and Oliver Iron Mining Division of U. S. Steel Corporation. Crushed ore enters the rotating kilm at the far end, burning fuel at the near end. Burners also are staggered along the walls of the kiln for more finite control of reduction to a synthetic magnetite. The kiln to be used by Hanna at its 10-ton-an-hour plant will be 88 feet long, 8 feet 8 inches in diameter and will burn gas from a gas-producer unit. It will be part of a continuous concentration process in which the synthetic magnetite will pass directly to magnetic separators after cooling and an intermediate grinding stage. Oliver Mining's two-ton-per-hour plant will have its magnetizing roasting equipment at Coleraine, and the separators at Duluth. The kiln, which will be 50 feet long and six feet in diameter, will be operated initially with reformed propane gas; natural gas or gas produced from lignite or coal can also be used. According to Dravo engineers, a kiln about 164 feet by 12 feet, with a capacity of 60 to 80 tons an hour would be needed for the smallest practical plant. Larger kilns or multiple units could be used for greater capacity.



When you're at the American Mining Congress, October 10-13, in Las Vegas, drop in at CF&I's booth 1004. The exhibit will feature the complete line of quality steel products CF&I manufactures for the Mining Industry.

Engineers will be on hand to answer any questions you may have, or you are welcome to use our message center, make phone calls, use our secretarial service, or just relax in a pleasing atmosphere.

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Southern Mica Corporation in Spruce Pine, North Carolina, is installing a 48foot dryer, one of the largest being used in this section of the mica mines.

The East Fork mine, near Del Rio, Cocke County, Tennessee, is now producing approximately 50 tons per day of high grade barite. This new mine is the only active producer in the Del Rio barite district.

Pennsylvania State University is inaugurating a student-trainee program to supplement the regular four-year curriculum in mining engineering. The program, which will go into effect in July, results from concern about the shortage of engineers entering the mining industry in contrast with the demand and opportuni-ties in the field. Designed to provide a steady supply of technical personnel for maineral industry companies, the plan calls for students to attend school six months, then work in industry six months during a four-year period, followed by a fifth year of continuous school work. Participating companies, of which there are ipating companies, of which there are nine to date, will provide employment to trainees for alternating periods. Most firms will sponsor pairs of students, so one works while the other is in college. Selection of trainees, from ranks of employees and recent high school graduates, will be by the Department of Mining at Penn State or by cooperating companies, presently including Climax Molybdenum, General Crushed Stone, Hanna Coal, Harbison-Walker, Island Creek, and Harbison-Walker, Island Creek, and Jones & Laughlin. Interested candidates are urged to apply immediately to Penn State at State College, Pennsylvania.





A huge 60-ton-capacity haulage truck which the M. A. Hanna Company is testing at its Hunner mine on the Mesabi range is powered by a Diesel-electric system with a 700 horsepower engine that supplies power to a Diesel generator set. This, in turn, feeds four electric motors, one mounted in each wheel. Output per wheel is 175 horsepower, but the unit can be converted to increase that to 450 for a total of 1,800 horsepower. Built for Hanna by the United Rig and Equipment Company of Tulsa, Oklahoma, the truck is trade-named the "Lectra-haul." Designed for two or fourwheel drive, selected by the driver for each haul, the truck speed is 18 miles per hour for the four wheel set-up, while 35 is the two-wheel top speed. Power steering, dynamic electric brakes, and an auxiliary friction brake are other features of the truck which will turn in a 50-foot diameter circle. The Lectrahaul is a semi-trailer type with a two-axle overhung design.

W. S. Moore Company, Duluth, Minnesota, is negotiating with Pickands Mather & Company, Duluth, to operate the Scranton mine at Hibbing, Minnesota, where operations ceased in July. Pickands Mather has been connected with the mine since 1904. Iron ore shipments up to January, 1958, totalled over 23,-000,000 tons. W. S. Moore plans to add additional beneficiating facilities to the

existing washing plant in an effort to treat some of the leaner ore remaining in the deposit,

Jones and Laughlin Steel Corporation, Minnesota Ore Division, recently awarded a construction contract to Western-Knapp Engineering Company for construction of concentrator facilities at the Cretaceous ore deposit near Calumet, Minnesota. The process will utilize spirals and froth flotation for the concentration of stockpiled Cretaceous ores from the Hill Annex mine at Calumet. Completion date for these facilities is scheduled for next summer.

Iron ore shipments from upper lake ports in the Lake Superior region are well ahead of those in 1959, except from Ashland, Wisconsin. For the season up to August 1, shipment of taconite pellets by Reserve Mining Company from Silver Bay, Minnesota, totalled 3,089,448 tons, compared with 2,781,178 tons last year at this time, while tonnage of pellets by Erie Mining Company from Taconite Harbor amounted to 3,361,951 tons, up from the 1959 figure of 2,370,982 tons. Total shipments have amounted to 42,265,773 tons, compared with 35,599,390 tons in 1959. Tonnage from United States ports in the region was 40,116,937, compared with 33,894,268 tons last year, while that from Canadian ports totalled 2,148,836 tons, an increase over last year's figure of 1,705,-122 tons.

A ruling against the state of Minnesota on the ownership of iron ore tailing deposited in O'Brien Lake at Nashwauk, Minnesota, was made recently by the district court in Grand Rapids, Minnesota. The state brought action against the Cleveland-Cliffs Iron Company and the International Harvester Company, defendants, who claimed ownership of the tailing, as the state asserted, but intended to store it for future processing to recover the iron content.

Inland Steel Company is acquiring an interest in the Empire Mining Company, formed recently to take over from Marquette Iron Mining Company the Empire property near Negaunee, Michigan. Inland Steel sold its interest in Marquette last year. The Empire firm will develop the Michigan property, which contains a low grade iron ore which will be a future source of high grade pellets for Inland's blast furnaces in the Chicago, Illinois, area.

A complete renovation of the electrical system has been completed at the Sunday Lake mine, Wakefield, Michigan. The overhaul program covering from the 31st level underground to the sub-station on surface was accomplished without interference in mine operation. Installation of automatic pumps on three levels made necessary installation of more modern equipment, as well as addition of Telescan, a signal system from pump stations to the mine engine house. Signals are transmitted to the surface and register on a panel board to acquaint the hoistman with conditions of the pumps. Three gauges on the panel indicate amount of water in sumps in each of the three levels of the underground. Telescan can also relay signals by remote control to places up to 25 miles distant, so that in case of trouble a watchman at the Peterson mine at Bessemer can be alerted.



SEYMOUR J. SNARL Last Angry Media Man

Meet Seymour J. Snarl, last angry media man and clear thinking industrial space buyer of Belchfire Associates Advertising. He knows every rep from Portland, Oregon to Portland, Maine and has had lunch with most of them. He had a few things to observe when we talked last week:

"Media buying is the toughest job of all", quarrels Seymour, "but nothing like the old days." "Sure", he snapped, "we still get a lot of phony claims to swim through. Even so, today it's better. Much better."

"Good, reliable market and media data available from smart publishers today. Standard presentations for basic facts good, tob. Like the new AIA media data form. No question, publishers generally giving us outstanding stuff."

"What's most important? Lots of things. The good old ABC statement is still at the top of the list—look for it first. Tells me quick what people in an industry are readers, how many, and where. Let's face it, there's no substitute for the ABC Statement. Best measure I know of reader preference. They want the book and they paid for a sub. Would you buy a subscription to a magazine you didn't want?"

"No, Seymour, we wouldn't. And thanks again. We'll see you next month."

MINING WORLD



A MILLER FREEMAN PUBLICATION

precipitates—ROCKY MOUNTAIN-

Anaconda Explores for Copper In Beaver County, Utah

The Anaconda Company is currently exploring for copper on a 12-square-mile lease in the Milford area of Beaver County, Utah. Options have been obtained from owners in the San Francisco and Rocky mining districts in case Anaconda should find a deposit worth further investigation. E. O. McAllister of Tooele reportedly is in charge of the firm's preliminary geological mapping and geophysical survey work.



At Crested Butte, Colorado, Silver Crest Mining Company is open-pit mining gold ore and started milling it in the new mill July 5. The firm also does custom milling. R. F. Magor III is general manager of the operation.

Benson Mining and Leasing Company has started shipping ore from the Continental Chief silver-lead-zinc mine which is at the head of Iowa Gulch nine miles from Leadville, Colorado. The first shipment of one carload to the Arkansas Valley smelter of American Smelting and Refining Company was also the first in three years that had been shipped for smelting and assaying from a mine in the Leadville district. According to Robert Benson, owner of the operating company, the ore had a high silver content. The portal of the mine is 12,500 feet above sea level and clearing ice from workings has been underway since May. The Continental Chief was first opened in 1884; last exploration work was done about 30 years ago.

Production is increasing daily at the flotation mill of Standard Metals Corporation in Silverton, Colorado, where the new equipment is being adjusted to treat the expanding output of ore from the company's mine. Rapid progress is being made at the company's Silver Lake holdings to assure a continuous supply of ore to the mill. Progress at the American Tunnel indicates cross cutting will be completed about the first of the year. A raise will then be driven to connect with the old workings of the Sunnyside mine.

An information center on rock physics and mechanics will be established as a joint project of the Colorado School of Mines and the CSM Research Foundation, together with the Lawrence Radiation Laboratory of Livermore, California. The center will collect, classify and evaluate data concerning behavior of rocks subjected to various physical conditions. The Lawrence Laboratory sponsored the center because of its interest in the Atomic Energy Commission's Plowshare program, conceived at the laboratory, which is exploring the peaceful uses of nuclear explosions. The center will be under direction of Dr. John S. Rinehart, professor of mining engineering and director of the CSM mining engineering research laboratories, and Fred L. Smith, manager of the foundation's mining division.



The Keystone Mill Division of Northwest Defense Materials on July 15 started trial runs of a beryllium flotation circuit in its Keystone, South Dakota mill. In addition to beryllium concentrate, the mill will produce tantalite, columbite, potash feldspar, and mica, according to Peggy Kennan, president of the firm. The operation is designed to process 100 tons of ore a day, using a new method that will eliminate present hard cobbing methods in which about two-thirds of the total beryl in the ore is lost.

At a recent meeting of the Black Hills Resources Association in Custer, South Dakota, a talk and a demonstration on the berylometer was presented by Jack Silman and Dave Marshall, geologists with International Minerals and Chemical Corporation. General headquarters of the association have been established in the office of York Minerals, Inc. at Custer and a mining library set up. Meetings of the group are held every other Friday. C. E. Ricketts, secretary of the group, invites Black Hills visitors to attend meetings, use the library, and stop by at the headquarters. He may be reached by mail at P. O. Box 3132 in Rapid City, South Dakota.



Centennial Development Company will sink the 440-foot incline winze for Kennecott Corporation at its mine in the East Tintic district of Utah. Most of the exploration work of the last two and a half years including the Burgin shaft sinking, driving of drifts, and major underground and surface drilling has been done by Centennial. An Eimco mucker is being used in sinking the winze which will penetrate ore areas at a 25° slope. Sinking the winze will permit Kennecott to determine water and mining conditions, verify ore grades, and get information needed for location of the production shaft when mining starts. Contract for 20,000 feet of rotary drilling to determine extent and thickness of the volcanic rock section was reportedly awarded to Boyles Brothers Drilling Company of Salt Lake City. Drilling will be on a grid pattern from the surface north and south of the Burgin shaft. The project, which has been carried out by Bear Creek Mining Company, Kennecott's exploration subsidiary, has been transferred to Kennecott's development department, headed by Lowell Moon.

According to Frank B. Jewett, Jr. president of Vitro Corporation of America, the deposit of beryllium ore located by Vitro Minerals Corporation in Utah has promising prospects, but several steps must be taken before extent of the ore body and method of refining can be determined. Vitro Minerals is owned by Vitro Corporation and by Rochester & Pittsburgh Coal Company. Mr. Jewett

said normal chemical reduction can probably be used on the ore and the metal or concentrate possibly can be produced more cheaply than from imported ores. Vitro may establish a fully integrated beryllium production system or it may take part in a joint venture with other concerns.

Recent discoveries of high grade leadzinc ore in Utah's Tintic district may indicate only a part of the area's mineral
potential, according to H. E. Raddatz,
president of Tintic Standard Mining
Company. Discoveries by Bear Creek
Mining Company off the Burgin shaft
were in only one alteration area in the
district. According to a recent alteration
map published by the United States Geolog cal Survey of the East Tintic mining
district, there are a number of similar
areas which have never been explored
and which offer interesting possibilities.
About 2,500,000 tons of high grade ore
have been mined in past years from two
shafts on Tintic Standard properties, west
and northwest of the Burgin shaft. According to Mr. Raddatz, during 1959
Bear Creek, in an exploration project for
Tintic and other mining companies, completed 6,816 feet of underground and
surface core drilling, for a total of 29,588
feet since the project began. Bear Creek,
in addition to sinking the 1,102-foot
Burgin Shaft, carried out 1,979 feet of
drifting and cross cutting in exploration,
making the total of that work 6,178 feet
including the shaft.

Yuba Consolidated Industries, Inc. of San Francisco has purchased federal and state leases that cover an estimated 120,-000,000 tons of phosphate rock near Flaming Gorge dam site in the Uinta Mountains of Utah.



R. W. Adams of Rawlins is developing an open pit uranium operation about 40 miles north of Douglas, Wyoming. A large tonnage of oxidized uranophane ore averaging 0.25 U_sO_s has been blocked out above the water table. He expects to ship his ore to the Riverton mill of the Susquehanna Western Corporation.

Continental Uranium Company of Wyoming, a subsidiary of Continental Materials, is sinking its second shaft at Crooks Gap, south of Gas Hills. It is a two-compartment rectangular shaft and will be sunk 600 feet to develop a deep ore body.

Tidewater Oil, Skelly Oil, and Getty Oil companies have started stripping a uranium ore body in the Central Shirley Basin area of Wyoming. This new open pit mine is to be called the T.S.G. No. 1. Platte Construction Company of Rawlins has the contract to remove 2,500,000 cubic yards of overburden to reach the top of a uranium horizon 125 feet from the present surface. Stripping should be completed by October when mining is to begin. Stripping crews are now working two 10-hour shifts with seven Euclid scrapers and three bulldozers.

ARIZONA



Another phase in the continuing expansion program of Kennecott Copper Corporation in the Ray-Hayden, Arizona, district, will be construction of a plant to supply "milk of lime" conditioning agent for flotation at the Ray concentrator. Western-Knapp Engineering Company of San Francisco, California, designer-builder of the \$20,000,000 Ray smelter, will construct the 60 to 100-tons-per-day lime plant. Five shaft-type vertical kilns to meet varying feed conditions of the flotation plant will provide the new addition with flexibility. Widely varying degrees of oxidation in the low grade copper ore now require a variance in use of lime ranging from six to 10 pounds per ton of feed. When less oxidized ore is reached in the Ray pits, requirements for lime for pH control will probably drop to about four to six pounds per ton. Fine lime rock for the new plant, as well as for fluxing materials for the reverberatory furnace at the Ray smelter will come from a nearby quarry opened on a test basis by a Western-Knapp mining crew in 1958. Kennecott has completed its annual vacation period and will be on a seven-day week for the rest of the year.

Two carloads of ore are being mined and shipped daily from the Chillito mine, northwest of Hayden, Arizona. The ore, said to be averaging about 1.5 percent and well over 80 percent silica, goes to the Asarco smelter at Hayden. Mike Guzman of Superior is operator of the mine.

The two smoke stacks of the old Copper Queen smelter at Douglas, Arizona, were razed recently because they were becoming an accident hazard. These smoke stacks, one 236 feet high and the other 265 feet, were built in the early 1920's, out of brick on a raised concrete base.

The 5-compartment 1,020-foot Palo Verde shaft of Banner Mining Company scheduled for completion by the middle of July was sunk under contract by Centennial Development Company of Eureka, Nevada. Banner will take over the further development of the mine by drifts, crosscuts, etc., conducting the work on company account. Some production from the Palo Verde mine is expected by the end of this year, mainly from development headings, with output gradually increasing to 1,000 tons per day late in 1961. Drilling in the vicinity of the shaft area has outlined two types of ores: (1) Lower grade ores which may be mined later by open-pit methods and for the most part located above a depth of 700 feet below surface; and (2) higher grade ore which can be mined by underground methods, located at depths ranging from 650 to 1,100 feet below surface. Banner has estimated the total reserves of low-grade pit-type ore and millable capping in the Palo Verde deposit, including higher grade ore mentioned above, at 42,730,200 tons. The ore body is still open and undrilled on three sides and additional drillings is in progress to prove its final extent. At present, three diamond

drills and one rotary are engaged in this part of the exploration program, drilling on the east and west sides of the shaft. A crew of about 40 is working at the Palo Verde, about half of them employed by Centennial Development in shaft-sinking operations three shifts six days a week, the remainder by Banner on construction work at the surface plant and by the drill contractors. A. B. Bowman, Tucson, Arizona, is vice-president and general manager; B. W. Venable, general mine superintendent. Palo Verde mine is on state lease lands, about one mile northeast of the company's Daisy mine, and surrounded on three sides (north, east and south by American Smelting and Refining Company's Mission project where construction of a 15,000-tons-per-day mill is underway.

Work on the adit project at the old Congress mine, near Congress Junction, Arizona, has been resumed by the Glendel Mining Company. Pat Sayre of Skull Valley holds the contract for a 500-foot advance of the adit driven 100 feet last year. The company's objective is the downward projection of the shaft workings on the Queen of the Hills vein. The current work is conducted on a one-shift basis. D. W. Jaquays, of Phoenix, is president of Glendel.

The Multi-Metals Mining Company, headed by Sam Hughes, Prescott, Arizona, has started preliminary work at the Joker mine. A mill and surface plant, with a daily capacity of 50 tons, is being constructed. The property is said to have been an early day producer of high-grade gold-silver ore.

CALIFORNIA



The Morgan Creek mill of Union Carbide Nuclear Company near Bishop, California, is now on a seven-day, threeshift operating basis. The mill treats ore from the Pine Creek tungsten mine. Union Carbide recently acquired some additional mining claims south of Pine Creek and adjacent to present claims.

Roy Johnson of Progressive Mining & Milling Corporation reports that his company is developing barite and limestone deposits on leased property in Ritter Canyon, California. Progressive Mining is headquartered in Las Vegas, Nevada, and Mr. Johnson is located in Caliente, California.

Idaho-Maryland Industries, Inc. is the new name adopted by Idaho-Maryland Mines Corporation, which had its beginning in the Grass Valley, California area in 1863. The company still retains mineral rights in the area, but has no plans to resume mining in the near future.



Bagdad Breaks Ground for \$2,000,000 Plant

Ground-breaking ceremonies on July 20 officially launched the construction work on Bagdad Copper Corporation's \$2,000,000 leaching plant at Bagdad, Arizona. The plant is scheduled for completion in March of 1961. Fisher Contracting Company of Phoenix will build it. Shown here at the ceremony are, left to right, Roxie L. Webb, director of Bagdad Copper; Governor Paul Fannin of Arizona; Warren Hunter, vice-president of Fisher Contracting Company; George W. Colville, executive vice-president and general manager of Bagdad, and David C. Lincoln, Bagdad president. The leaching plant and its auxiliary sulphuric acid plant are being erected two miles west of Bagdad's present mill. The project is designed to recover copper from the low-grade oxide stockpile and from additional oxide ore that is stripped daily to reach the ore supply for the flotation mill. The conventional leach-precipitation method will be used to produce cement copper which, in turn, will be shipped to the smelter. About 32 tons of tin cans will be required a day. When completed, the plant will operate on an around-the-clock basis, employing a working crew of 16 men. Bagdad estimates that production will amount to about 20 tons of copper a day. Edward Howell, metallurgist, will be leaching plant superintendent and Fred Wheadon, assistant superintendent. Ervin C. Harney is Fisher company's division manager for the project; Dick Heinke is in charge of construction.

Surface Mining Symposium At Arizona College of Mines

A three day symposium is being conducted by College of Mines faculty and industry at the University of Arizona, Tucson, from October 17th through 19th.

This is another in the series of Symposia of the Mineral Industry being sponsored by the College of Mines, J. D. For-

rester, dean.

All interested open pit operators are invited to attend and should they desire additional information it can be obtained by writing to H. E. Krumlauf, professor of mining engineering at the University. The preliminary program includes the

The preliminary program includes the following speakers: Monday morning October 17: Limestone Quarrying, Production of Cement, and Related Problems at Oro Grande Plant, Riverside Cement Company, Gordon E. Pflug, assistant to superintendent of mining, Riverside Cement Company.

Open Pit Mining of Phosphate Rock in

the United States, G. Donald Emigh, director of mining, Monsanto Chemical Company.

Open Pit Operation of 3-Vein Gypsum Deposit by Back-Cast Stripping Method, F. C. Appleyard, manager of mines, United States Gypsum Company.

Monday afternoon: Eagle Mountain Mine; Drilling and Blasting of Extremely Hard Rock; Use of 65-ton Semi-Trailer Type Trucks, Martin J. Hughes, manager, Eagle Mountain mine, Kaiser Steel Corporation.

The Open-Pit Copper Mine, William R. Hardwick, mining methods research engineer, U. S. Bureau of Mines, Region III, Tucson, Arizona.

General Blast Hole Drilling at Silver Bell, Harry M. Conger, pit supervisor, Silver Bell unit, American Smelting and Refining Company.

Maintenance of Main Line Haulage in the Morenci Mine, David H. Orr, mine superintendent, Morenci Branch, Phelps Dodge Corporation, Morenci, Arizona.

Tuesday morning October 18: Com-

puters and Computer Applications. A. Wayne Wymore, professor of numerical analysis and director of numerical analysis laboratory, University of Arizona.

Use of a Digital Computer in the Cal-

Culation of the Economic Limits of an Open Pit Mine Expansion, James F. Olk, chief mining engineer, Pima Mining Com-pany, Tucson, Arizona.

pany, Jucson, Arizona.

A Comparison of Various Methods of Calculating Ore Reserves Using a Digital Computer, Richard F. Hewlett, graduate student, College of Mines, University of Arizona.

Estimation of Shovel and Dragline Output for Systems Analysis, Elmer R. Drevdahl, associate professor of mining engineering, College of Mines, University

Tuesday afternoon, papers by: Kennecott Copper Corporation, Duval Potash and Sulphur Company, and Inspiration Consolidated Copper Company.

Wednesday morning October 19: Meet at Mining-Geology building for trip, if desired, to American Smelting and Refining Company's Mission mine, Arizona's newest copper mine.

U. S. Bureau of Mines Begins **Extensive Research Projects**

An intensified research program begun by the U.S. Bureau of Mines is aimed at development of new mineral sources, improvement of mining methods, and advancing metallugical techniques for a wide variety of minerals. The program for the current fiscal year, which began July 1, will be carried out at the Bureau's many research laboratories and other facilities throughout the country.

Development of new improved alloys suitable for structural use in high-speed aircraft, missiles, and other important ap-plications will be emphasized in the Bureaus' research on magnesium.

Ways to strengthen the domestic in-dustry and lessen dependence on imports will receive top attention by the Bureau in its program dealing with iron ore. This will include systematic sampling of major ranges in the Lake Superior district and study and appraisal of iron resources of Alaska, the Pacific Northwest, and Rocky

Mountain states.
Research planned for uranium and thorium during the year will include mining and metallurgical investigations of radioactive raw materials, studies to develop methods for controlling radioactive uranium-mill wastes, and a search for new uses for nuclear techniques and materials.

Development and use of low grade domestic sources of alumina for produc-ing aluminum will be chief objectives of the Bureau's research on bauxite and aluminum. Investigations will be continued on increasing efficiency in underground bauxite mining, adaptability of the Pedersen process to recover alumina from low-grade ferruginous bauxite of the Northwest, and beneficiation and re-covery of alumina from sub marginal ores of Hawaii and Arkansas.

In its copper research program, the Bureau will study such aspects as me-chanics of block-caving structural factors affecting stability of open-pit slopes, and the behavior of flat-lying roof strata in room-and-pillar mining. Metallurgical re-search on copper smelter slags will also be emphasized.

Beryllium, the space-age metal that has caused a virtual boom in Utah recently,

and germanium, now obtained solely as a byproduct of base-metal processing, will also receive major attention from the Bureau, Two mobile field laboratories will Bureau, Two mobile field laboratories will join the Bureau's wide-spread hunt for beryllium, while metallurgists continue studies to develop economic mineral-dressing techniques. Economic recovery of germanium from local fly-ash and development of simpler methods for finding this metal will be emphasized.



Ruby Hill Mining Company is the newly organized firm that will act as operator for the five mining firms associated in the development of the Richmond-Euin the development of the Richmond-Eureka Mining Company lead-zinc-gold mine in Eureka, Nevada. The \$1,000,000 development program will be financed by \$250,000 each from Newmont Mining Corporation, Cyprus Mines Corporation and Richmond-Eureka, with another \$250,000 furnished by Hecla Mining Company and Eureka Corporation together. The latter has held a lease since gether. The latter has held a lease since 1937 on the property on Ruby Hill about two miles northwest of Eureka in east central Nevada. United States Smelting, Refining and Mining Company, which holds a 60 percent interest in Richmond-Eureka, will loan Richmond its share in the project contingent on refinancing of the latter firm. The agreement also provides for raising another \$9,000,000 to finance the mining operation, in which case Ruby Hill would own the project and the five companies would hold interest in that firm in relation to their investment. Ruby Hill has begun a dripping program, using a large rotary drill, in efforts to determine location and grade of additional ore bodies.

Beryllium Resources Inc. of Salt Lake City is dropping its option on a beryllium deposit in the Mt. Washington mining district southwest of Ely, Nevada. The firm had already paid an initial instalment of about \$100,000 to purchase the deposit from Mt. Wheeler Mines, Inc. of Salt Lake City. According to Bruce or Sair Lake Cry. According to Bruce W. Odlum, president, the amount and grade of ore developed so far by his firm does not justify further expenditure, but the geological knowledge obtained can be used with profit on other beryllium properties the firm has or is acquiring.

The Mexican mine in the Lone Mountain district about six miles northwest of Alkali Springs in Nevada will be the first property scheduled for exploration and development by a Nevada firm, Consolidated Mines, Inc. Values at the mine are in silver and copper. The firm has other properties under option, including the Clifford mine, an old gold producer; the Spanish mine in the Liberty district; the Yellow Gold group in the Cloverdale area, and the Black Top claims north of Tonopah. tain district about six miles northwest of Tonopah.

Columbia Iron Mining Company during July had 12 surface diamond drill rigs operating on the Nevada claims it has optioned from Mineral Materials Company. Columbia is the western mining subsidiary of United States Steel Corporation. (See MINING WORLD, May 1960 pers. 200) 1960, page 29).

Activity on property known as the Oro Del Rey claims in the Johnnie district of Nye County, Nevada, has resulted in location of 679 placer claims with an area of 160 acres each. Surveying of the critical property in the critical property of the c with an area of 160 acres each. Surveying of the entire group has been completed, necessary location work done, and a washing plant built which operated successfully during test runs on various gravels. The present group of owners is headed by W. F. King and associates of Las Vegas, Nevada who began testing in the district in 1957. After unsuccessful efforts to use dry placering, the operators decided to develop water and use sluice boxes for gold recovery.

Gold Ventures is a newly incorporated Colorado firm that plans to mine gold in the Virginia City, Nevada territory. One of the firm members is R. Gerald Hughes, formerly an operator of Bald Eagle mine on the Comstock Lode.

NEW MEXICO



The Atomic Energy Commission has extended the uranium concentrate pur-chase contract of Homestake-Sapin Partchase contract of Homestake-Sapin Partners to December 31, 1966. Homestake-Sapin Partners, which operates a 1,500-ton-per-day mill near Grants, New Mexico, is a partnership comprising Homestake Mining Company and Sabre-Pinon Corporation. The new contract provides for a stretchout of a portion of the pre-1962 production to the 1962-1966 period.

Recognition for outstanding safety records was given to employees of the Chino Mines Division of Kennecott Copper Cor-Mines Division of Kennecott Copper Corporation by the United States Bureau of Mines in July with presentation of three Joseph A. Holmes safety awards. The crushing department of Chino's reduction plant received an award for operating 614,300 man-hours without a disabling injury from December 25, 1953 to December 31, 1959 Average pumples of emperations. cember 31, 1959. Average number of emcember 31, 1959. Average number of employees in this period was 48. Charles Stretz, mill electrical foreman, was honored for supervising an average of 25 men for 739,670 man-hours without a disabling injury for the period between October 11, 1949, and December 31, 1959. Third award went to Raymond R. King, crushing foreman of the primary and secondary crushing plants, who supervised a 16-man crew without a disabling injury for more than 15 years. His crew worked 690,135 man-hours during this period. 690,135 man-hours during this period.





First uranium processing plant in Texas, and the 26th for the nation, will Texas, and the 26th for the nation, will be built at Falls City by Susquehanna-Western, Inc. of Denver, Colorado, subsidiary of the Susquehanna Corporation of Chicago, Illinois. A uranium purchase contract involving the construction and operation was signed recently by the Atomic Energy Commission. The \$2,000,000 plant will have a rated capacity of 200 tons of ore per day. This will be the third uranium plant to be operated by Susquehanna which has a 500-tona-day mill at Edgemont, South Dakota, and a 400-ton-a-day at Riverton, Wyoming. Susquehanna has secured mining leases on certain Karnes County deleases on certain Karnes County de-posits in South Texas.. The mill, which is expected to start operation within a year, will use a complex metallurgical recovery system to produce the uranium concentrate known as "yellow cake."

Production and sale of Alkarb, a product composed of mixed carbonates of potassium, rubidium, and cesium, increased in 1959, it is reported by San Antonio Chemicals, Inc., a subsidiary of American Potash & Chemical Corporation. Interest in cesium and rubidium chemicals for industrial use is increasing. These compounds together with the These compounds, together with the metals, are being produced from Alkarb. Cesium compounds are being manufactured from pollucite ore.



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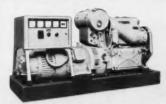
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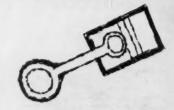
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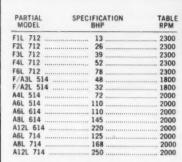
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Dawn Mining Expands Output With \$1,000,000 Acquisition

Dawn Mining Company is currently trucking from 1,400 to 1,600 tons of uranium ore daily from two open-pit mining operations in the Spokane Indian Reservation in Washington. About 400 tons of this comes from the Peters lease which Dawn recently acquired from Silver Buckle Mining Company of Wallace,

Dawn plans a major exploration and development program to boost output at the newly acquired properties, where production in 1959 totalled 25,294 tons. with shipments limited to between 70

and 110 tons per day.

The Silver Buckle property is near
Dawn's Midnite mine, which produces 1,000 to 1,200 tons per day, and near the company's 440-ton-per-day process-ing plant at Ford, Washington. Isbell Construction Company of Reno, Nevada, contractor for open-pitting and ore haulage at the Midnite, has taken over min-ing of the Silver Buckle lease. Merill Baldwin of Ford hauls the Silver Buckle

Silver Buckle took over the operation several years ago from Northwestern Uranium Mines, Inc., which discovered the uranium deposit. Although ore has been averaging only 0.13 percent, Silver Buckle had developed a mechanical upgrader that produced a marketable con-

The Washington ore body is involved in a suit which Silver Buckle and North-west, now liquidated, have brought against the United States Atomic Energy Commission. The two firms are suing for the \$6,000,000 they say they would have made if the AEC had fulfilled alleged

commitments to them concerning mill contracts and purchase agreements covering the Spokane Indian Reservation

Newmont Mining Corporation of New York City owns 51 percent of Dawn Mining and Midnite Mines, Inc. of Well-pinit, Washington, 49 percent.

Safety Council Convenes In Chicago Oct. 17 to 20

This year's Mining Section sessions of the National Safety Council Congress will be held in the Morrison Hotel at Chicago, Illinois October 17 through 20. The program committee, headed by Roy Stott, has arranged the meetings to stress direct participation of members and discussion

of common problems.

Charles R. Neil of Bethlehem Cornwall Corporation, general chairman, will open the session Monday, afternoon October 17. Subjects for discussion following election of officers include: Safeguarding Air Conditions for Trackless Mining; Safety Innovations Adopted for Heavy Equip-ment Repair and Maintenance Work, and The Third Approach.

On Tuesday afternoon topics scheduled are Safety in Rotary Drilling, and You Asked For It. The program for Tuesday afternoon covers Stope Filling, a report of the newly-elected general chairman, and a question and several project Al. and a question and answer period. Al-though topics for this session may be submitted during the previous two days, for maximum consideration members are urged to send their questions by mail to Mr. Stott, Room 4545, Interior Bldg., Bureau of Mines, Washington 25, D. C. Scheduled for the closing

Thursday afternoon are Safety Measures Adapted by the Uranium Mining Industry; How We Reduced Our Injury Frequency from 173 to 4 in Four Years, and a Preview of the Mining Section's Slides on Safety in Open Pit Operations. A tenminute discussion period has been scheduled after each presentation,

Afternoon sessions will start at 2:40 p.m., to accommodate those who will be attending the joint luncheon with cement, quarry and mineral aggregates, and coal mining sections in the Conrad Hilton



The Hyder mining district in Alaska is receiving renewed attention because another lens of high grade gold and sil-ver ore has been located by lessees in the nearby Canadian Premier mine.

Several thousand tons of uranium ore are being shipped this year by JOT Min-ing Company from the Kendrick Bay Mining Company pit and adjacent claims at Bokan Mountain, on the southern part of Prince of Wales Island, Alaska. First shipment of ore, which went to Lake-view, Oregon, was to be shipped August 30. JOT Mining is under new manage-

Sunshine Mining Company of Spo-Sunshine Mining Company of Spo-kane, Washington, operator of silver mines in northern Idaho, is reportedly taking part in a helicopter reconnaissance of two areas in Alaska. One is northwest of Mount McKinley where high grade silver mineralization has been found; the other area is Mount St. Elias, where receding glaciers have exposed mineral outcrops. outcrops.

Timbering of the mine portal, an ore chute, a manway and raise has been completed and drifting on a vein of gold-bearing ore started at the Mikado mine in the Chandalar District, Alaska. The work is being carried on by Little Squaw Mining Company, controlled by Grandview Mines and Metaline Mining Grandview Mines and Metaline Mining and Leasing Company of Spokane, Wash-ington. Karl W. Jasper is president of all three firms. Eskil Anderson, Spokane, is engineer and geologist.



Anaconda Thickener To Be One of World's Largest

As part of the \$6,000,000 modernization program recently announced by The Anaconda Company, construction on the new water recovery system at Anaconda, Montana, is well advanced. The new thickener will be 370 feet in diameter and form a pool tania, is wen advanced. The new discrete will be 500 feet in dialited and form a pool covering about 2% acres. Water recoverd from the tailings here will be pumped back to the concentrator for re-use at the rate of about 12,000 gallons a minute. Normal operation of the concentrator requires 88,000,000 gallons of water a day. The excavation for the new hydro-separator that will operate with the thickener is to be seen in the lower right corner.

IDAHO



Surface drilling exploration of a cop-per deposit is planned by Copper Camp Company at the Copper Camp mine in Edwardsburg Mining District 10 miles east of Big Creek, Valley County, Idaho. The \$34,840 project has been approved by the Office of Minerals Exploration, which will participate in the amount of \$17,420. Delbert H. Peterson, Boise, is company president, and Otis I. Sheetz, Boise, secretary.

Monsanto Chemical Company added 1,362 acres of phosphate land to its large phosphate holdings in southern Idaho's Soda Springs area. The firm was high bidder on the ground north of its present operations.

A \$400,000 hoist has been ordered by Lucky Friday Silver-Lead Mines Company for use at its Lucky Friday silver-lead mine east of Mullan, Shoshone County, Idaho. Delivery and installation is expected to take about one year. Limit of the present hoist is the present bottom 3050-foot level. The new hoist will permit operations at a depth of at least 5,000 feet. About 500 tons of ore are being treated daily in the new Lucky Friday mill. L. J. Randall, Wallace, is president of the firm and also of Hecla Mining Company, largest stockholder in Lucky Friday.

Hornsilver Mining and Milling Company of Wallace, Idaho, is being dissolved and assets distributed to shareholders. Assets include 13,340 shares of stock in Day Mines, Inc., obtained in exchange for the Hornsilver mining claims in the Silver Belt west of Wallace. Stockholders will receive three shares of Day Mines for each 400 shares of Hornsilver held. R. W. Anno of Wallace, Idaho, is secretary.

All mining and milling operations have been closed down at the Blackbird cobalt-copper mine in Lemhi County, Idaho. The former No. 1 cobalt producer in the United States, with 450 workers, has been on a salvage mining basis for the past year with about 40 on the payroll. Copper concentrates only were saved. The mine was operated by Calera Mining Company, subsidiary of Howe Sound Company, Isbell Construction Company, which handled open-pit mining, has moved out all heavy equipment. Machinery Center, Inc., Salt Lake City, which purchased mill equipment, has hauled away some of the machinery and some dwellings have been removed.

Nuclear Fuels and Rare Metals Corporation is equipping a thorite and rare earth processing mill recently acquired from Salmon River Uranium Development Coropration near Salmon, Idaho. Some of the equipment was acquired from a property near Ely, Nevada.

The Gay mine of J. R. Simplot Company near Fort Hall, Idaho, had a record production day early in July when 111 seventy-ton railroad cars of phosphate were shipped to the Pocatello fertilizer plant of Westvaco Chemical Division, Food Machinery & Chemical Corporation.

Directors of Vindicator Silver-Lead Mining Company of Wallace, Idaho, are studying several possibilities for development of its Vindicator mine because of proximity to the profitable Lucky Friday property near Mullan. Under consideration are sinking of the Vindicator shaft from its present 750-foot depth to explore in the company's workings, and also a possible extension of the present Lucky Friday 3000 level into Vindicator's ground. According to W. J. Logua, president, work to date at the mine indicates present structures that should be explored at depth. Other officers of the company, named at the annual meeting recently, are H. F. Magnus and Arthur Rieske. Last work at the mine was done in 1955 by Silver Buckle Mining Company under a DMEA program.



Mining operations have been resumed at the Cumberland mine located in the old mining camp of Castle, southeast of White Sulphur Springs, Montana. Present plans call for mining and shipping lead ore. Silverton Lead Mines Inc. operated the mine some years ago and in 1953 C. R. Oliphant and associates made shipments of surface ore from the property.

The Hughesville Timber and Mining Company working on the old St. Joseph Lead Company property near Hughesville, Montana, has started to dritt on a parallel structure to the main vein. The drifting operation is on a higher elevation than most of the older workings. St. Joe first began operations on the lead-zinc property in 1927, suspended operations in 1931, and reopened the mine again for several years until it was closed down in October, 1943.

The old Meadow Mountain tunnel near Saltese, Mineral County, Montana is being reopened by Mineral King Mining Company to reach a known ore zone which yielded some production of lead-zinc-silver ore years ago. A four-man crew has been cleaning up cave-ins and retimbering for several months. C. F. Buls, Missoula, Montana, is president and manager.

Continental Rare Metals Inc. which mines columbium near Darby, Montana, has been licensed to operate as an investment company.

An illustrated report that appraises tungsten resources in Granite and Deer Lodge Counties, Montana, has been published by the U. S. Bureau of Mines. The publication deals with the Bureau's recent field studies of known tungsten deposits in the Philipsburg Batholith of west-central Montana, and a recomaissance of potential tungsten-bearing areas. Second in a series of three reports on Montana tungsten, the reports can be obtained by writing the Publications-Distributions Section, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pennsylvania and asking for Report of Investigations 5612 "Tungsten Resources of Montana: Deposits of the Philipsburg Batholith, Granite and Deer Lodge Counties."



Open-pit mining to a depth of 370 feet is planned at Lakeview Mining Company's White King uranium mine, Lake County, Oregon. The pit will be about 1,500 feet long and 1,000 feet wide. Some 6,500,000 cubic yards of overburden and ore will be removed over the next three years by the contractor, Isbell Construction Company, Reno, Nevada. Work was started recently, using motor scrapers to remove overburden. Ore will be extracted by

power shovels and trucks. Underground mining operations from a 400-foot shaft were discontinued when the open-pit contract with Isbell was signed. Underground work will be resumed upon completion of open-pitting to mine ore remaining below the pit and in the pit walls. Howard Dutro is chief geologist and assistant general manager for Lakeview Mining. John Wright is superintendent for Isbell.

At the Buffalo gold mine in the Granite district of Grant County, Oregon, work continues on the lower adit. The level is 250 feet below previous workings and is being driven to tap the ore body which has supplied shipping and milling ore for many years. J. P. Jackson, Jr. is in charge of the mine and development work.



American Eagle Mining Company has resumed development work at its silverlead-copper property 12 miles southeast of Kettle Falls, Washington. Ronald Madden, Spokane, is company president; Frank Mitchell is mining engineer.

A specific gravity-type concentrator has been assembled at the Lead Trust mine in northern Stevens County Washington by Clayloon Uranium Company. Expected to handle between 800 and 1,000 tons of ore daily, the plant includes jigs, ore crushers, hoppers and a 175-horsepower diesel-electric power plant. Mill units were constructed in Spokane last winter and trucked to the property in June. Mill foundations were built in the spring. A mill building will be constructed over the machinery. Clayloon leased the property last August, uncovered a wide vein of lead-bearing ore with a bulldozer and drilled 14,000 feet of test holes to depths of up to 136 feet. Ore reserves ready for milling are estimated at 60,000 tons. At least this much additional ore is said to be blocked out, and considerable dump ore also is said to be available. Byrl T. Goodwin Jr., of Spokane, Washington is company president and manager.

A mobile spectroscopic laboratory has been developed at the Spokane, Washington office of the U. S. Bureau of Mines for use in a search for minerals of the scarce space-age metals, beryllium and cesium. The laboratory-on-wheels was assembled from a 1½-ton, four-wheel drive pickup chassis and a truck van. Laboratory equipment includes a carbon arc for vaporizing mineral samples and a spectroscope for identifying elements by their light wave lengths. Rock crushing and grinding equipment is mounted on a trailer frame pulled behind the truck. The search is just getting underway with cooperation of the Idaho Bureau of Mines and Geology, which will do advance reconnaissance and geological studies. Most of this summer's work will be in central Idaho. Montana's Ravalli County and Washington's Stevens County also may be visited by the traveling laboratory field party headed by E. S. Pattee, but the main Washington search will be made next year.



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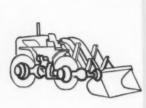
Cat's first wheel loader, the 2 yd. 944, introduced this spring, has already gained an acceptance unmatched in machinery history. Now there's a full line and one for your job: the 966, 2¾ yd., 140 HP, for high production jobs where you measure time in tons of material loaded; the new 922, an 80 HP, 1¼ yd. Traxcavator with all the safety and fast operating features of the two bigger machines. The 922 can give you speed, versatility and production to handle all those jump-and-run jobs.

Have you seen a 944 working in your area? Have you asked the owner about its dependability and favorite fea-

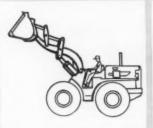
tures? He's probably got some mighty impressive answers. And frankly it's understandable why these Traxcavators have made a name for themselves so quickly. There is a 7-year history of thorough testing and development behind these new machines. They come from the manufacturer with 23 years' loader experience and 20 years of wheel tractor know-how.

Look at the features that are on all 3 loaders: clean, open cockpit, easy to get into; bucket arms up front away from the operator; well-balanced design; long dumping reach (nearly 5' on the 966), soaring lifts to get over truck sides

Both the 966 and the 922 have all the features proved in the field by the popular 944 Traxcavator



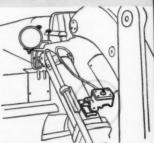
POWER SHIFT TRANSMISSION with torque converter gives smooth, instant shifting for 1st-2nd speeds—forward and reverse. In travel range, the machine is in 2-wheet drive for high-speed roading. A shift to work range automatically puts power to all 4 wheels for full traction.



OPERATOR SAFETY Lift arms and cylinders are all forward of the cockpit...giving complete freedom of movement. Visibility is excellent at all times. It's easy and safe to get into a Traxcavator from either side...up 3 wide steps...no ladders to climb. Tires are covered by fenders.



OPERATOR CONVENIENCE Bucket controls are on the right side, leaving the left hand free for machine operation. The forward-reverse lever is mounted on the steering column for finger-tip shifting without decelerating, steering is power boosted with dual-ratio on the 966.



AUTOMATIC BUCKET KICK-OUT DEVICE allows faster cycles. After loading bucket, pull lift lever to up position. Bucket goes up to dumping height and control kicks into hold position automatically. While lowering bucket after dumping, set tilt lever, and bucket is positioned for digging.



822 TRAXCAVATOR—11/4 CU. YD. STANDARD BUCKET • 80 HP. Your choice of compact 4-cylinder Caterpillar turbocharged Diesel Engine (uses low-cost furnace oil without fouling) or 6-cylinder gas engine with large cubic inch displacement for long life and sustained power. Use the type of engine that matches your other equipment. With

either engine you have one source of warranty responsibility...one source of parts and service...your reliable Caterpillar Dealer. • Long 40¾" reach at 7' dumping height... maximum lift of 11' 2". • For top production in its class, the new 922 Traxcavator has all the safe, fast operating features of the bigger machines.

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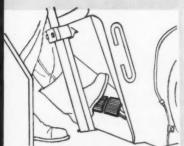
and railroad cars; automatic bucket controls to speed cycles; dependable Cat Diesel power with optional gasoline engines on two smaller models; Cat power shift transmission to change speed and direction with a finger touch, without decelerating; and service features like the dry-type air cleaner and unitized construction.

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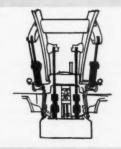
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ARE MAKING OTHER
LOADERS OBSOLETE



DUAL BRAKES The left brake pedal neutralizes the transmission as it stops the machine. This transfers extra power to the bucket...assuring full loads even in tough material. The right brake pedal stops the machine with the transmission engaged . . . giving full control for roading downhill.



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MEN who make the news in the U.S.A.



E. P. PFLEIDER



W. MACGREGOR



R. E. KENDALL



J. J. REED



R. HENDERSON

- E. P. Pfleider, chief of the division of mineral engineering of the University of Minnesota, has been named head of the School of Mines and Metallurgy in the Institute of Technology at the university. He replaces S. R. B. Cooke, chief of the division of metallurgical engineering. Dr. Pfleider has been a member of the Minnesota faculty since 1948, and is well-known internationally as a consultant on mine design.
- F. M. Galbraith has joined the geological staff of Republic Steel Corporation at Cleveland, Ohio. He has been most recently associated with the Columbia Iron Mining Company at Cedar City, Utah, a subsidiary of the United States Steel Corporation, and is a former chief geologist for Day Mines, Inc.
- Everett L. Joppa, general manager of Pickands Mather & Company's Lake Superior Mining Division, has been named a director of the firm's new corporation, PM Associates. Mr. Joppa will retain his present position as general manager in addition to serving on the board of directors. Mr. Joppa was put in charge of open pit mines at PM's Duluth, Minnesota headquarters in 1950; appointed general manager of mines in 1955 and general manager of the Lake Superior Division in 1957. Also joining the top executive ranks of the corporation as a director is Donald M. Chisholm, associate general manager of the Lake Superior mining division.
- Glen C. Mintner has been appointed underground maintenance foreman of St. Joseph Lead Company's southeast Missouri division at Viburnum. He is a former engineering department draftsman. Also named in personnel shifts within the company were Opal Henson and D. Clyde Richey, who have been appointed mill shift foremen at Viburnum. Both men have been repairmen at Indian Creek and former mill shift foremen at Mine LaMotte. James W. Ragsdale, engineering department draftsman since June, has been appointed shop foreman at Viburnum.
- Frank W. Wyatt, mill superintendent at Globe Mining Company, succeeds Ken W. Lentz as superintendent of the company's uranium mill in the Gas Hills, Wyoming.
- Douglas W. Middleton has been named development engineer of mining at the Columbia Iron Mining Company's Cedar City, Utah properties. He has been employed by the company since 1953.

- Wallace Macgregor, former treasurer of Climax Molybdenum Company and controller of American Metal Climax, Inc., has been appointed president of Climax Molybdenum Company and elected vice president of the parent company, American Metal Climax, Inc. Mr. Macgregor succeeds Frank Coolbaugh as president of Climax Molybdenum.
- R. E. Kendall has been appointed to a newly-created position as engineering manager of United States Borax and Chemical Corporation mine and processing plants at Boron, California. Mr. Kendall, who has been with the company since 1954, was named assistant mine superintendent in 1956 when open-pit stripping started at Boron.
- John P. Lacke, general superintendent of the Vinegar Hill Division, Wisconsin, operations of American Zinc, Lead and Smelting Company, has been promoted to the position of resident manager. Paul F. Mills, assistant superintendent, has been promoted to the position of mine superintendent.
- S. E. Jerome, northwest district geologist for Bear Creek Mining Company subsidiary of Kennecott Copper Corporation, has left the organization to form a brokerage firm in Salt Lake City, Utah. Mr. Jerome will deal in speculative mining and oil issues when the company becomes active this month.
- Richard J. Menze has joined International Minerals and Chemicals Corporation of Skokie, Illinois, as assistant production manager of all consolidated feldspar department plants and quarries in the United States and Canada. He was formerly associated with Tennessee Copper Company and the Magnet Cove Barium Company.
- Ernest L. Ohle, chief geologist since 1957 of the Copper Range Company and its subsidiary White Pine Copper Company, has been named vice president, exploration, of copper range.
- V. L. Mattson, formerly manager of mining and milling for Kerr-McGee Oil Industries, Inc., has been named general manager, minerals. Other organizational changes in the minerals division affect: R. T. Zitting, formerly manager of mineral exploration, now manager, mineral exploration and land; and Phil Ellsworth, formerly district geologist at Golden, now promoted to chief geologist (minerals).

- John J. Reed, head mine research engineer of the St. Joseph Lead Company of Missouri, has been appointed professor of mining engineering at the Colorado School of Mines in Golden. Mr. Reed, who had been employed with the company since 1955, was responsible for the organization and development of a mine research department which included work on rock breaking, rock drilling, rock mechanics, grouting, mechanization, rock bolting, and pillar recovery.
- Robert Henderson has been appointed vice president of the western operations of the Climax Molybdenum Company, a division of American Metal Climax, Inc. Until his appointment, Mr. Henderson had been general manager of the western operations of Climax. He has been associated with the company since 1936. He will be in charge of all of the company's molybdenum and tungsten production from its mine and concentrator at Climax, Colorado, and also its activities in the production and concentration of uranium and vanadium in Colorado, Utah, New Mexico, Arizona, and Texas.
- Charles Davis has succeeded H. R. Brisley as head of the smoke department at the Copper Queen smelter of Phelps Dodge Corporation of Arizona. Mr. Brisley is retiring after 40 years service with the company. His successor at the smelter has been a member of the department for 20 years.
- Edward L. Pine, former Nevada state highway engineer, has assumed duties as president and general manager of the Isbell Construction Company, mine stripping contractor, of Reno. He succeeds C. V. Isbell, who is retiring from active management of the construction company.
- John W. Chandler has been appointed manager of the mining department of the Mining & Exploration Division of American Metal Climax, Inc., New York City. He succeeds C. A. R. Lambly, who resigned to become president of the Trout Mining Company of New York.
- Alvin O. Johnson has been appointed superintendent of field engineering for Oliver Iron Mining Division of United States Steel Corporation, with headquarters in Hibbing, Minesota. Mr. Johnson is a graduate of the University of North Dakota and became associated with Oliver in 1950 as a design engineer. His staff will include James Robertson, Robert Koski and Herman Haase.

Asarco's New Mission Project on Schedule

This aerial photograph shows how fast the new Mission project is going ahead south of Tucson, Arizona. Key points of interest are at (1) where the two stripping pits will soon be joined; (2) here the underground excavation has been completed for the primary crushing plant; (3) concrete foundations are rapidly being poured for the equipment in the 15,000 ton per day mill; (4) excavations for the two large tailing thickeners is complete; (5) the open pit copper mine of Pima Mining Company; and (6) Pima's crushing plant and flotation mill.

The crushing plant and mill were designed and are being erected by Western Knapp Engineering Company of San Francisco, California.



Beryllium Resources Gets Permit for Mexican Mining

An agreement between Beryllium Resources, Inc. and the Mexican government will permit the Los Angeles-Salt Lake City firm to explore for, develop, mine, and concentrate beryllium on a cost-plus basis for the Mexican government. The scarce, heat-resistant mineral is one of the three nationalized minerals belonging to the Mexican Atomic Energy Commis-

The Mexican contract also includes construction of beryllium extraction plants in Mexico if exploration proves such action advisable. The plant construction will be undertaken in cooperation with Brush Beryllium Company of Cleveland, Ohio.

The agreement would result in the United States firm acting as an agent for the Mexican A.E.C. in selling the metal on the world market. Reimbursement for exploration and mining cost will be made by the Mexican government to Beryllium

by the Mexican government to berynnum. Resources, which is also to receive a percentage of sales proceeds.

Permission to mine and export for its own profit minerals other than those which are nationalized is included in the contract. This provision would apply to a variety of metals including gold and lattern. platinum.

Beryllium Resources, Inc., is owned jointly by Federal Resources Corporation and Hidden Splendor Mining Company, a subsidiary of Atlas Corporation. The firm recently dropped its option on a beryllium deposit near Ely, Nevada.

Cerro de Pasco Acquires 50% Interest in Chilean Claims

Cerro de Pasco Corporation has acquired a 50 percent interest in 13,000 hectares of copper mining claims ad-joining its Rio Blanco copper property in central Chile. The claims are known as Don Pancho, 4,000 hectares; San Emilio, 1,500 hectares; Don Samuel, 5,000 hectares; and Los Andes, 2,500 hectares. They are located in the valley of the Rio Blanco north of the Rio Blanco copper properties presently controlled by Cerro.

This recent acquisition was acquired from Mr. Samuel Mould, an American mining man well known in Peru and Chile. Mould filed on these claims in Chile, Mould filed on these cianus in 1955 shortly after he began prospecting at the confluence of the Rio Aconcagua and Rio Blanco.

Potash Company Replacing Ice Wall By Grouting Shaft

Complete removal of the ice wall and use of the grouting process to preserve the shaft is under way at the Patience Lake, Saskatchewan mine of Potash Company of America Ltd. The entire area was frozen before shaft sinking started in 1955 because of difficult ground conditions including several water-bearing zones and quicksand.

Sinking of the shaft to 3,500 feet was completed in 1958 and mining operations begun. However, in November 1959 the amount of water entering the shaft reached 35 gallons per minute. Cementation Company (Canada) Ltd. was called in to cope with the situation, but before crews could begin work, water inflow had increased to 350 gallons per minute, which required installation of more pumps on an emergency basis.

The inflow was brought under control

within three weeks, but the shaft bottom

was extensively damaged.

Now Potash Company finds it advisable to have Cementation undertake a program of completely thawing the ice wall which surrounds the shaft lining and to treat the ground to provide an impermeable grout membrane as a substitute for the ice. The remedial work is expected to take about a year.

The Patience Lake property has a potential annual production capacity of 600,000 tons of potash per year. Explora-tion indicates a belt of potash 300 miles It is estimated that some 4,000,-000,000 tons of high-quality potash lie beneath the Province of Sashatchewan at an average depth of 3,000 feet.

Inactive Vancouver Mine May Be Put In Production

An offer to put an inactive Vancouver Island copper mine into production has been made by Consolidated Mining & Smelting Company of Canada Ltd. to Coast Copper Mines Ltd. The mine is on the northern part of the island about 25 miles southwest of Port McNeil. Consolidated Mining is majority stockholder in Coast Copper which was organized in

1916 but has never produced. Cost of underground equipment, preproduction development, and working capital would be about \$1,800,000 which Consolidated Mining would raise by un-derwriting a share of Coast Copper. Con-solidated Mining also offers to build a concentrator, power plant, camp, and other buildings to be used by Coast Copper on a toll basis.

or reserves at the property are esti-mated at 2,000,000 tons assaying 2.5 per-cent copper. There seems to be little possibility of finding more ore, so the project will be essentially a salvage op-

Nippon Mining Co. Options Chapi Copper Mine in Peru

The Nippon Mining Company, operating one of the largest copper smelters in Japan, has been given an option to purchase the copper mine of the Cia. Minera Chapi, S. A. This mine, with reported reserves of 80,000 tons of 3.5 percent copper ore, is located some 65 kilometers southeast of Arequipa at 8,530 feet elevation. It is reported that Nippon Mining plans to establish a new mining company in Peru capitalized at \$3,500,-

The Chapi mine was discovered in the early 1900's and has been owned and worked in recent years by Sr. Luis and worked in recent years by Sr. Luis Chabaneix of Lima. Production from the mine is said to have been less than 50,000 tons of high grade hand picked ore assaying between 15 and 40 percent copper. Extensive reserves of low grade ore are said to exist.

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UNITED ARAB REPUBLIC—Start of production from ilmenite deposits in the Egyptian part of the United Arab Republic is scheduled to start in September. The General Ilmenite Company, organized about three years ago, is developing deposits of the Abu-Chalaga mines. The Montecatini Company of Italy reportedly has agreed to buy 30,000 to 40,000 annual tons of concentrate from the company.

AFRICA-Mining interests from several European countries are reportedly active in securing rights to investigate Sudanese iron ore deposits.

UNION OF SOUTH AFRICA-Location of a bentonite deposit 180 inches thick near Parys in the Orange Free State was reported recently.

NIGERIA—A production goal of 75 tons of columbite, with four tons of tantalite as a byproduct, has been set by Gold & Base Metals Mines of Nigeria, Ltd. for the current year. Tin is still the most important metal mined by the company, which hopes to produce 780 tons this year. Last year's sales of tin totaled 454 tons.

SOUTH WEST AFRICA-Rio Tinto Company Ltd. has recently acquired the Emko Mining and Trading Company Ltd. and will take over that firm's copper rights in the Windhoek-Okahandja-Onganga area. Initial plans call for mining and exporting copper ore. The company may also produce concentrates for smelting by Tsumeb Corporation, which is building a copper smelter scheduled to start production in 1962.

FEDERATION OF RHODESIA & NYASALAND—A reported emerald discovery in the Mazoe district of Southern Rhodesia, about 30 miles from Salisbury, is being investigated by geologists from the Southern Rhodesian Government Mines Department. The claim has been registered by a three-man syndicate. A security clamp-down on exact location of the find and other details has been imposed at the request of the Mines Department.

FRENCH WEST AFRICA—Copper and manganese deposits in the Gaoua, Haounde and Banfora regions of the Upper Volta are being studied. Aerial prospecting of a 23,000-square-kilometer area near Gaoua and Po is now under way. Radioactive minerals research has been undertaken by the Atomic Energy Commission, with aerial prospecting in the Bobo-Dioulasso and Boromo regions.

UNION OF SOUTH AFRICA—An intensified exploration program under way by Consolidated Murchison (Transvaal) Goldfields and Development Company Ltd. will continue and be further expanded in the future. The company recently acquired 1,032 base-metal claims in the Letaba district. The company operated at full capacity in the last half of 1959 with tonnage mined entirely from

the Gravelotte section, which has a limited life although development continues to be well ahead of mill requirements.

FEDERATION OF RHODESIA & NYASALAND—Rand Mines Ltd. is continuing its copper prospecting operations in Southern Rhodesia and South West Africa where indications of a major copper zone have been reported. The firm's research activities are being centralized, improved and modernized. Ground has been acquired in Johannesburg for erection of new buildings. The company has abandoned, however, its holdings east of property owned by Western Holdings immediately south of the Vaal River, where drilling continues. Investigation of an iron ore deposit in the Rustenburg area of the western Transvaal has been discontinued also.

GHANA—Ariston Gold Mines (1929) Ltd. anticipates that its present capital expenditure program will extend through 1968 when new areas will have been opened up and a more detailed picture of the known ore body at depth will develop. The present tonnage target is 480,000 tons but it seems unlikely that this goal will be achieved by the current year's development-in-ore program.

UNION OF SOUTH AFRICA—Winkelhaak Mines Ltd. has been granted an additional lease over 25 claims on the southwest part of its property, increasing its mining area to 5,363 claims. Additions to the gold plant are near completion raising the capacity to between 90,000 and 110,000 tons per month. Further expansion to increase capacity to between 150,000 and 180,000 tons per month includes sinking of a 23-foot-diameter shaft in the southeastern section, about 6,000 feet northeast of No. 3 shaft, to a depth of 4,300 feet. A cross-cut from No. 3 shaft workings toward the site of the new shaft is being driven and full-scale sinking should start early next year. Capital expenditure for the project is about £2,500,000.

GHANA—All four dredges of Bremang Gold Dredging Ltd. have now been moved and will be in operation all during this year. Net profits of the company were £222,111 in 1959 compared with £154,036 in 1958, reflecting improved conditions that can be expected to continue through 1960, according to C. J. Burns, chairman. The No. 3 dredge worked for only seven and a half months last year following its transfer. Bremang has decided that its £150,000 debenture granted to the Ghana government as cover for its loan will be paid within three years instead of five. First of the three equal payments has been appropriated in the 1959 accounts.

UNION OF SOUTH AFRICA—Zandpan Gold Mining Company Ltd. is using a Blair stage-hoist for the sinking stage and a 200 hp. hoist to operate the brattice-wall stage in sinking its No. 1 shaft in the south central section of its lease area located just north of the southern common boundary with the Vaal Reefs and Western Reefs properties. A satisfactory progress rate is being maintained even though water-bearing fissures that require cementation present difficulties. Plans are already under way for sinking a second shaft, which will probably be northeast of No. 1.

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NORTH AMERICA

QUEBEC-At Valiant Gold Mines in northern Quebec final plans have been made for a new prospecting program that will include 16,000 feet of drilling.

NORTHWEST TERRITORIES-One of the major developments of the 1959 prospecting season, a tungsten discovery in the MacKenzie Mountain Range, is in the MacKenzie Mountain Range, is proving to be of greater tonnage and higher grade than first indicated as the result of a drilling by Canada Tungsten Mining Corporation. Initial drilling indicated 1,166,351 tons of open-pit ore averaging about 2.18 percent WO₅. Detailed drilling so far this year has increased the reserve estimate to 1,310,650 tons, while the grade has gone up to 2.51 tons, while the grade has gone up to 2.51 percent. These figures are based on a length of only 500 feet; the ore is wide open at both ends so even more en-couraging estimates are looked for. The development is significant because present reserves amount to nearly half the known total reserves of the United States, and about one-tenth of those in the Free World. Canada Tungsten's 83-claim property is about 150 miles north of Watson lake on the Alaska Highway and a few miles east of the Yukon- NWT border. Officials hope to make a decision this fall about construction of a mill, probably of 300-ton-per-day capacity, so that equip-ment can be taken in this winter and production scheduled a year from now.

ONTARIO-Cordoba Mines is undertaking further prospecting activities on its Red Lake property. The company plans deeper drilling through over-lying iron formations to test gold values in the host rocks beneath.

SASKATCHEWAN-In the intensified exploration program of Sico Mining Corporation in the Rottenstone Lake area initial drilling showed a width of 31 feet averaging 2.9 percent nickel, 1.0 percent copper, 0.01 ounce gold, 0.04 ounce platinum, and 0.08 ounce paladium. Previous estimates were that the deposit contained some 50,000 tons of ore grading up to 2 percent nickel. Sico will bring two more drills to the property this season, Geophysical and prospecting parties are following up a previous aerial survey on several areas in the 506-square mile mineral reserve. Rio Tinto Canadian Extended to the control of ploration Ltd. and another Canadian firm are associated with Sico in the venture.

OUEBEC-Denison Mines' new exploration division has initiated several projects in its search for base metals as well as industrial minerals. In Masham Townas industrial minerals. In Masnam Township, northeast of Ottawa, the division is investigating a molybdenum prospect, while in the southern portion of Louvicourt Township, east of Val d'Or, crews are at work on a gold prospect where visible gold is indicated in quartz in strong shear zones. Drilling will be undertaken soon in this area. On the Lapaska property in the same township the comproperty in the same township the company is evaluating results of previous operations. Denison holds two properties in Montbray Township, northwest of No-randa, and both will be investigated this randa, and both will be investigated this season. An aerial electromagnetic survey followed by geophysical work is being undertaken in Boyvinet Township, and geological mapping is scheduled on Denison's property near Marathan, Ontario, where ceramic grade nepheline syenite has been indicated.

BRITISH COLUMBIA — A develop-ment program is being launched by Yankee Dundee Mines Ltd. which was recently reactivated with new financing. Initial work at the company's mine at Ymir will be diamond drilling to obtain further knowledge of the Bonus vein, thought to be similar to the prolific Yankee Girl vein which was profitably mined kee Girl vein which was profitably mined for several years. The Bonus vein was en-countered in the low-level drive from Wild Horse Creek 2,000 feet below the surface. Drilling will be done from the 1,235-foot level on the Yankee Girl mine. The company will also search for an ex-tension of the Yankee Girl and Dundee veins at different horizons as well as investigate base metal possibilities of the Lakeview fault zone.

ONTARIO-Premium Iron Ores Ltd., in association with Steep Rock Iron Mines Ltd., has indicated a large medium grade iron ore deposit in the Lake St. Joseph area north of Sioux Lookout, The ore can be concentrated and pelletized making possible a 3,000,000 ton per year operation. Studies on the most economic process for handling the ore are being continued by Ungava Iron Ores Company, owned by the two firms and other con-



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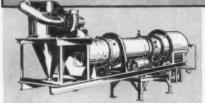
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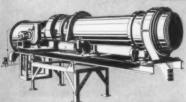
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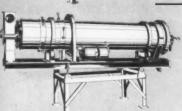
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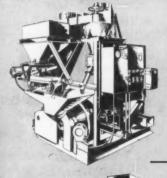
Double-shell, indirect-heat, gasfired dryer for drying without contamination. Volatiles removed with only limited dilution. Shell rotation speed and shell slope easily changed, Bulletin AH-472.



STEAM TUBE DRYER

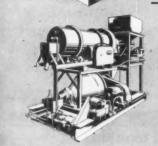
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INTERNATIONAL -

NEWFOUNDLAND—An increase of production is planned at the Tilt Cove copper mine of Maritimes Mining Corporation at Notre Dame Bay. Daily mill capacity will be expanded by 1,000 tons to an output of 3,000 tons. The mine is presently Canada's sixth largest copper producer.

BRITISH COLUMBIA—Bralorne Pioneer Mines, Ltd., British Columbia's largest gold producer, has completed sinking on the Queen shaft to 60 feet below the 38 level station. A new 38 level will be opened to develop a large and promising block of 77 vein ore between the 35 and 38 levels. Development of the 79 vein on the lower levels shows continued improvement in width with additional depth. Surface trenching on the recently optioned Ace holdings has extended the surface discovery to nearly 200 feet. Ore averages about 0.5 of an ounce of gold over three feet. The company is participating in resumption of work on the Snell mercury prospect and on a newly acquired base metal gold prospect in central British Columbia. Franc R. Joubin, Vancouver, is president.

ONTARIO — Reopening of its nickelcopper mine on the Worthington Offset in the Sudbury area is under consideration by Associated Arcadia Nickel Corporation Ltd. because of offers from metal dealers to purchase concentrates. The mine is being kept dewatered and the company estimates the property could be brought into production within 90 to 120 days. The ore indicated down to the 950foot level is estimated to yield 10,000,000 pounds of nickel and 12,000,000 pounds of copper, plus substantial values in precious metals.

NORTHWEST TERRITORIES — Operations on the Matthews Lake gold property of Salmita Consolidated Mines Ltd. show promising results. At Horse Head Lake in the southern section of the company's properties close to the Taurcanis Mines' boundary, bulldozing has uncovered additional gold showings. This occurrence is a strong blue quartz vein with widths up to 17 feet, one of the widest quartz bodies in the area. The season's program has extended the length by another 200 feet, with gold in evidence. The showing is close to the favorable volcanic-sedimentary contact. In the firm's No. 1 shaft area, a mile to the north, trenching and blasting have revealed fairly high grade visible gold. The Matthews Lake property is operated by Mack Lake Mining Corporation of Yellowknife, which owns the adjoining Pia Group where exploration has disclosed a quartz vein containing interesting gold values. Mack Lake will start sinking the No. 2 shaft this season to intersect the five indicated gold veins insuring production potential of enough ore to keep the Salmita 100-ton mill operating around the clock. The No. 2 shaft will be sunk to two more levels but production is scheduled to begin immediately on completion of the combined first levels joining the No. 1 and No. 2 shafts.

BRITISH COLUMBIA—An estimated 2,626,000 tons of iron ore, 51.9 percent iron, has been developed at Harrit Harbor, Queen Charlotte Islands, by Silver Standard Mines, Ltd. The deposits can be mined by low-cost continuous methods, according to R. R. Wilson of Toronto, Ontario, president.



UNITED KINGDOM—The new flotation plant for separation of pyrite and arsenopyrite at the Cambourne, Cornwall, operation of South Crofty Ltd. is expected to start operation this season. The tin mining company recently rebuilt its concentrating plant so that increased tonnage can be handled.

YUGOSLAVIA—Latest ore reserve estimates at the Zletovo lead and zinc mines near Probistip, Macedonia, indicate there are sufficient reserves for 15 years. The operation, second largest lead-zinc project in the country, produces about 220,000 tons of ore yearly. Ore assays about 12.5 percent lead and 1.5 to 2.0 percent zinc. The mines are located about 100 miles southeast of Skopie, capital of Macedonia, with main ore bodies near Dobrevo where the mine and workshops are located. Ore is transported by aerial tramway to Probistip where the flotation mill, crushing facilities, and main offices are situated. Concentrates are sent to the Trepca mining operation to be smelted.

SPAIN—Among foreign investors in Spain's mining industry are the Swiss firm Eurinvest of Lugano and the Italian firm Fundazione Lerigi of Milan. The Swiss now have increased to 49 percent their participation in the Arlos fluorspar mining company which operates in the province of Asturias in northern Spain. The Lerigi company has a 48 percent interest in Prospecciones Lirigi Espanola, a new drilling concern.

EAST GERMANY-Phosphates and other products are being imported from Tunisia in exchange for construction machinery and other items, according to a recent trade agreement reported by the official East German news service ADN.

CZECHOSLOVAKIA—A 24 percent increase in uranium ore production by 1965 is planned here by further exploration and reorganization of present processing plants, Output in the 1956-1960 period was increased by approximately 33 percent.

UNITED KINGDOM—An increase in iron ore production from about 17,000,000 tons yearly to 25,000,000 tons by the end of 1970 has been recommended in a report drawn up by the Home Ore Committee, which represents the Iron and Steel Board, the British Iron and Steel Federation, ore producers and foundry pig iron manufacturers. The report also endorses the Board's arguments in favor of completing further steel capacity in the United Kingdom's main ore fields, meaning somewhere in Lincolnshire or Northamptonshire.

YUGOSLAVIA — Preliminary preparations are under way at the Picelj mine in the mountains of Kopaonik so that mining of asbestos can begin in 1960. Development plans include construction of a separation plant at the mine, where reserves sufficient for 20 years of continued operation are indicated. Initial output is scheduled to be 1,500 tons of asbestos fibre yearly, with an increase to 3,000

tons when all exploration work is completed. The mine is owned by the mining enterprise Kosmetasbest, which is engaged in further exploration in areas near Radovac, Rujiste and Borcan.

SWEDEN-A new record was set by Boliden Mining Company for ore production during 1959, with a total of 2,366,000 tons of ore delivered to concentration plants. Previous years' figures were: 1955-1,515,000 tons; 1956-1,683,000; 1957-2,215,000, and 1958-2,216,000. The Laisvall mine, now rated number four in the country, produced more than 700,000 tons of lead ore.

SPAIN—Cia. Altos Hornos will increase output at its Vizcaya operation to 1,000,000 tons of steel per year, and at the Sagunto plant to 400,000 tons per year. The company is currently negotiating for

construction of an oxygen process steel plant; building a 1,000,000-ton blooming-slabbing mill, and completing an electrolytic tinning plant at Echevarri. Orders have been placed for LD equipment of 350,000-million tpa. capacity and further plans call for installing semi-continuous mills for rounds and hot strip. Cost of the expansion totals 4,700,000 pesetas, so the firm will increase its capital by some 50 percent. Production of Altos Hornos during 1959 totalled 614,000 tons of pig iron, 690,000 tons of steel and 420,000 of rolled goods.

NORWAY—The Norwegian parliament, Stortinget, has sanctioned the government's proposal for an exploration drift at the copper deposits in the Kautokeino district where diamond drilling has indicated some million tons of 2.0 percent Cu. Residents of the district, however, were

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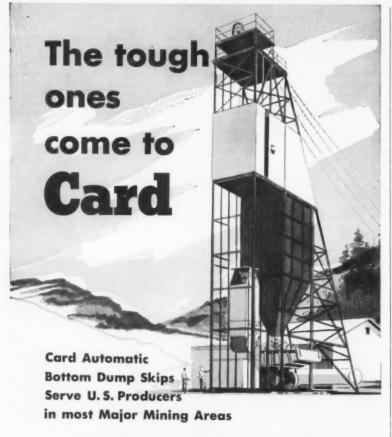
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cautioned against making premature plans for any large-scale mining operation.

SPAIN-Current mining problems will be discussed this fall at Oviedeo when the Union of Spanish Mining Engineers holds a symposium October 3 to 8

SWEDEN-Development of the Kautsky lead mine on the west side of Lake Laisan in northern Sweden has been started. Sinking of a shaft to the 160meter level began in July and a crushing plant will be built. The Kautsky deposit is part of the Laisvall lead ore district of the Boliden Mining Company.

NORWAY-Titania A. S. plans to start mining operations in September at its Tellness ilmenite deposits in the West Norway district of Jossingfjord. Yearly production is expected to be about 300, 000 tons of ilmenite concentrate. Titania A/S last year produced 226,000 tons of ilmenite concentrate in the nearby Sandbekk mines.

GREENLAND—Drilling for molybde-num, begun last year near Mestersvig, was continued this summer in the same

SPAIN—Potasas de Navarra is a new firm capitalized at 750,000,000 Pesetas and controlled by INI. The firm expects to mine 50,000 tons of potash per year initially, reaching 200,000 tons per year within the property of the period of the peri within six or eight years.

YUGOSLAVIA - An extensive deposit of natural pozzolane, known here as opal breccia, is being mined in the vicinity of Kumanovo in northern Macedonia, and used in making concrete. The mineral has properties similar to high-furnace slags, but analysis shows it contributes to faster setting time, better hardness, imperme-ability, and resistance to frost and cor-

UNITED KINGDOM - Although Great Britain continues its efforts to increase output of home-produced iron ore, which is of low grade but considerably cheaper than imported ore, the iron and steel industry expects to step up imports in order to meet expansion demands. By 1962 the tonnage imported is expected to exceed 22,000,000 long tons, compared with about 16,000,000 in

NORWAY—A detailed plan for development of the extensive iron ore deposits in the Dunderland Valley of northern Norway has been submitted to the Norwegian Ministry of Industry by Rana Gruber A/S, the state-owned mining company. According to Ludvig Larsen, Rana president, regular mining, based on two years of experimental operation, could be started next summer. The matter will probably be discussed in the Storting (Parliament) this fall. If that group agrees, some 210,000,000 Norwegian kroner will be invested to develop the mines and build a concen-trating mill. Annual output is estimated at 750,000 tons, with some 500 men employed. The nearby state-owned steel works at Mo-in-Rana would probably use all the concentrate produced. A second development stage under consideration involves investment of a further 40,000,000 kroner to increase output of concentrate to over 1,000,000 tons by 1970. The Mo-in-Rana pilot plant continues operation.



KOREA-A mining investment program drafted by the Mining Bureau of the Ministry of Commerce and Industry calls for \$2,487,000 earmarked for the mining division. Coal mining development will be allotted \$1,387,000 and metallic mining the remainder. Projects in the latter division are: mining development and test drilling, \$475,000; improvement of facilities at Changhang refinery, \$350,000, and improvement of Yangyang iron mine, \$275,000.

THAILAND—Anglo-Oriental (Malaya) Ltd., is operating a 15-cubic-foot seagoing bucket dredge on tin-bearing land off the coast of Bhuket Island, Thailand. The dredge was reconstructed last year. Output of tin concentrate from the company's mines in Thailand during the fiscal year ended March 31 was 1,190 tons as against permitted exports of 1,187 tons.

MALAYA—Iron ore mining at Gunong Idong, Perak State, has been started by the Perak Iron Mining Company. Ore will be trucked to Damar Laut, Lumut, for direct loading to ocean-going vessels.

INDIA—An integrated plant to produce fabricated aluminum from aluminum ingots will be built in the Salem district of Madras with the cooperation of the Montecatini Company of Italy. Madras Aluminium Company is the name of the Indian firm to undertake the 10,-

000-to-per-year project, expected to be completed in 1962. Cost of the project is estimated at Rs 130,000,000. The Madras government will contribute a substantial share of the investment through the State Industrial Corporation, but the undertaking will be in the private sector.

ISRAEL.—The integrated steel plant of Israeli Mills Ltd., which will not be fully completed until 1964 or 1965, is currently producing about half its ultimate yearly capacity of 100,000 tons of steel and iron products. The rolling mill has two 18-inch mills, a 12-inch mill, a 10-inch mill and a Morgan unit. Production of pig iron in the electric melting furnace began late last year. Siemens Martin furnaces are designed to produce 120,000 tons of ingots per year. Employment at the plant near Haifa Bay is now about 750; eventually there will be about 900 workers. Although most high grade ore for the plant is imported from Europe, there are hopes of using ore found at Har Ramim near the Lebanese border. Plans also call for building a plant near Manara where ore from that area and pyrite sinter from the chemicals and fertilizer plant in Haifa will be treated to increase iron content from 26 to 42 percent.

MALAYA—The tin mine of Rahman Hydraulic Tin Ltd. resumed full operation in July after being closed down for four and a half years.

INDIA—Several government mineralogists are prospecting for gold in the Charwal and Chamoli districts. Reports indicate that people in the area for some time have been extracting gold from sand, mud, and silt from the Alaknanda River and its many tributaries. The government team is also investigating possibilities of copper deposits in Tarakhani and other places in the area. Deposits are known to exist but potential worth has not been determined.

TURKEY — Sitki Kocman Company, one of the country's major mining firms, has purchased the concession of Coreler in western Turkey, south of the town of Bursa. The company plans to build a concentration plant in the area.

INDIA—Deposits of high grade lead discovered in the Hazara district are reported to be large enough to meet the country's entire demand for this mineral. A report submitted by a German firm that conducted a geological survey indicates the deposits contain some 400,000 tons of ore with lead content averaging 70 to 80 percent.

PAKISTAN—Deposits of laterite, estimated at 50,000,000 tons, have been located in the Ziarat area of the Quetta region. Preliminary investigation by the Geological Survey of Pakistan indicates an area of about 500 square miles contains laterite in beds ranging from two 40 feet in thickness. Average iron content is about 29 percent. Laboratory tests and mineralogical work are now being undertaken in the Central Scientific and Industrial Research Laboratory in Karachi. Drilling operations are scheduled. If the project develops successfully, these reserves combined with good quality iron in the Dalbandhin area of the Quetta region will give impetus to the development of the iron and steel industry of this country.

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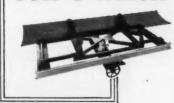
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NEW CALEDONIA—Production of nickel ore last year was more than doubled, mainly because of resumed export to Japan. Total output for the year was 1,378,500 tons, compared with 594,955 tons in 1958. Grade was 3.2 percent nickel, plus cobalt, and 25 percent water. Exports to Japan totaled 790,600 tons. Chrome ore production decreased from 47,393 tons in 1958 to 43,965 tons. Iron ore output was 286,900 tons, nearly the same as the 1958 tonnage of 295,110 tons; grade was 55.5 percent. All of the iron ore was exported to Australia.

TASMANIA—King Island Scheelite Ltd. will step up production at its scheelite treatment plant, which will now operate on a 24-hour, five-day week basis. The company has just negotiated a two-year contract for its output.

QUEENSLAND – Increased emphasis on copper production by Mt. Isa Mines Ltd. is reflected in production figures for the fiscal year ended June 30. Total ore production rose 17 percent, or 409,507 tons, for a record 2,268,086 tons. Copper ore treated increased by 558,493 to 1,914,656 tons. Export of concentrates rose from 37,000 in the previous year to

96,641 tons. Total production of lead ore decreased by 148,986 to 922,416 tons. Silver-lead-zinc ore treated during the year amounted to 773,430 tons. Production figures for the last 32 days of the fiscal period were: lead ore, 74,476 tons; lead bullion, 5,000; zinc concentrate, 3,526; copper ore, 178,581, and blister copper, 4,175 tons. Concentrates exported in that period totalled 9,604 tons. Mt. Isa's copper smelter capacity is currently being expanded from 40,000 to 60,000 tons per year, a project scheduled for completion in mid-1961.

AUSTRALIA—The Federal Cabinet is considering lifting the 21-year-old ban on exporting iron ore. A proposal under study would allow export of up to 50 percent of any iron deposits discovered in the future, limit export to a total tomage to be fixed from year to year, and forbid the export of ore from existing reserves. A survey completed by the Commonwealth Bureau of Mineral Resources early this year showed that Australia has other large deposits mainly in Western Australia and Queensland not included in the known reserves which are greater than when the ban was first imposed. Lifting the ban would induce private companies to prospect intensively for new deposits besides bringing some &A 20,000,000 yearly to the country.

WESTERN AUSTRALIA—A new company, Basis Materials, has been formed by Garreck Agnew Pty. Ltd. of Perth and Frank Samuel & Company, Inc., an American firm. The new concern will mine extensive magnesite deposits in the

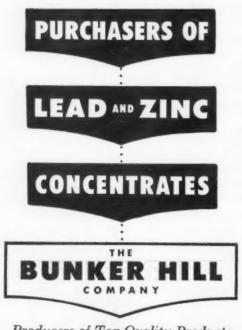
1867

Ravensthorpe area, with production to begin this fall at the rate of 1,000 tons per week. An initial contract has been made with an American company for 50,000 tons of magnesite worth £A 558,000.

AUSTRALIA—The federal government has decided to continue permanently the tax concession to the mining industry which exempts from taxation 20 percent of profits or dividends paid from profits, earned by companies from prescribed minerals. Uranium and gold are exempt from income tax under a separate concession. In sixteen years the value of mineral production in Australia has increased almost £A 200,000,000 and that of mineral exports about £A 4,000,000.

REPUBLIC OF THE PHILIPPINES—Tonnage of ore treated by Lepanto Consolidated Mining Company during May was 38,660 producing 4,942 tons of concentrate estimated to contain 2,854,740 pounds of copper and 4,740 ounces of gold. According to V. E. Lednicky, company president, the concentrate production contained 28.88 percent copper and 0,959 ounces of gold per dry short ton. Average copper content of ore was 3.85 percent and average gold content 0.156 ounce per ton. Copper recovery during the month was 96.0 percent; gold recovery was 78.7 percent.

WESTERN AUSTRALIA—Lake Campion and the surrounding vicinity contains significant reserves of alunite and was the former site of a government-owned plant for production of alumina and byproduct potassium salts.



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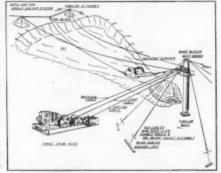
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INTERNATIONAL -

NEW SOUTH WALES—Six leading Japanese zinc producers have recently contracted to import 18,000 tons of zinc concentrate from the Broken Hill area, with shipment to be made early next year. Japan plans to import about 100,000 tons of zinc concentrate this year, with Australia supplying 70 percent, and South America and Canada much of the remainder.

NEW ZEALAND—Investigation of the proposed establishment of an iron and steel industry based on New Zealand iron sand will be undertaken solely by the government, said Minister of Industries and Commerce Holloway recently. There would not be sufficient cooperation between private and government interests in a joint venture, he feels. Since the industry would have a profound effect on New Zealand's economy, a thorough and impartial examination of all aspects is essential before any commitments are made, Mr. Holloway stated. The government-sponsored company will undertake only investigations, expected to last about three years.

AUSTRALIA—Demand for minerals will continue at a satisfactory level for the rest of this year, according to a Bureau of Mineral Resources forecast, Highlights of the Bureau's recent reports include price improvement for zinc and for lead; a long-term picture of adequate supplies of copper at reasonable prices if no strikes occur; a moderate increase in tin production; testing of bauxite deposits and trial shipments from Western Australia, and difficulties for gold producers because of rising costs and increased wage demands. The Bureau reported the last year set a record in demand for Australian opals. Last year's total export value was £A675,000, almost a 100 percent increase over the previous year. Japanese purchases of Australian opals increased to a value of £A363,000. Uranium oxide production was established at more than 1,000 tons per year.



LATIN AMERICA

DOMINICAN REPUBLIC—A 15,600-ton shipment, first portion of a 800,000-ton iron ore order for Ferrostaal A.G. of Essen, West Germany, has been made from the Dominican Republic. Arrangements have been made to increase output because of the order, which may be repeated. Present production from the Hatillo mine is 1,000 tons daily, and another 900 tons per day will soon be produced from deposits at Mogote and Laguna. Reserves of an estimated 6,000,000 tons of ore (averaging 65.5 percent iron) will be fully developed in the next five years. Another deposit of ore, which grades 50 to 58 percent, located at La Trinchera, may later be the basis for establishing a steel industry in the republic.

COLOMBIA—Production of the Colombian dredging operations of South America Gold & Platinum Company has been ahead of predictions so far this year. The firm's underground mine at Frontino is rapidly approaching the forecast level, with actual production ahead

of the 1959 quarter because of the strike last year. The company's gold produc-tion for the first quarter this year was 40,034 ounces, compared with 25,147 in 1959. Platinum produced in the period totaled 4,127 ounces, compared with 3,-715 ounces last year.

BRAZIL-Sociedade Cliffe e Mineracoca is a subsidiary company formed recently in Sao Paulo by Cleveland Cliffs Iron Company of Michigan for iron ore prospecting, mining, and shipping.

production of SURINAM-Bauxite N. V. Billiton Maatschappij Surinam is expected to increase considerably this and marketing prospects year. favorable. An annual turnover of 1,250,-000 tons is estimated in the next few years. The Surinam firm is an affiliate of The Billiton Tin Company of the Netherlands.

ARGENTINA—Philipp Brothers of New York recently bought 200 tons of Argentine beryllium ore at government auction. Price was \$339.00 per ton.

BRAZIL—Mineral exports for 1959 were double those for 1958, totalling 4,000,000 tons. Value of exports from Cia Vale do Rio Doca, chiefly iron, was S44,500,000. Manganese ore, totalling 958,000 metric tons valued at \$33,400,000 was exported. The territory of Amapa alone exported 752,000 metric tons of manganese.

COLOMBIA-Production declined and volume treated dropped for operations of Pato Consolidated Gold Dredging Ltd. in 1959 because Dredge No. 4 was out production for several months during its flotation move to a new site. Average recovery was 2.12 cents per cubic yard under that for 1958. In general, all dredges are moving into areas of lower values. During the vear the dredges handled 20,579,000 cubic yards of gravel, average grade was \$0.1670 per yard, and net sales value of bullion production was \$3,435,741.

MEXICO-The HyL process used in Monterrey to produce sponge iron is under consideration for development of iron ore deposits at las Truchas, Michoacan. The conventional method and electric furnace process are also under study. If the conventional method were used it would require shipping coal from Coahuila. Power is available from the new el Infiernillo hydroelectric plant.

Intriguing Headline Wrong

I suppose I am not the first to write to you about this, but I could not resist telling you how intrigued I was by a headline in your July 1960 issue on pages 34 and 35.

After reading the title "WET SCREENING . . . Finnish method eliminates ore buying prior to processing" four times, I plunged into the article to seek the technique for achieving the promised economies but, alas, the only method described was of a technical albeit practical nature. We all make "boo-boos" but those in large type do stand out.

J. Koslov

Chief Process Engineer Vitro Engineering Company

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- ober 5, 6, and 7. Sixth annual ROCKY MOUNTAIN MIN-ERAL CONFERENCE, Newhouse Hotel, Salt Lake City, Utah.
- October 10 through 13. METAL MINING SHOW sponsored by the American Mining Congress, Convention Center, Las Vegas, Nevada.
- October 17 through 18. Biennial Symposium on DRILLING AND BLASTING, at Golden, Colorado, sponsored by mining departments of University of Minnesota, Pennsylvania State University, and Colorado School of Mines.
- October 17 through 21. NATIONAL METAL CONGRESS AND EXPOSITION, Trade and Convention Center, Philadelphia, Pennsylvania.
- November 3, 4, and 5. Annual meeting of the NEW MEXICO MINING ASSOCIATION and the SOUTHWEST MINING ASSOCIATION, La Fonda Hotel, Santa Fe, New Mexico.

1961

- February 15, 16, and 17. SYMPOSIUM ON FLUIDIZATION sponsored by The Royal Australian Chemical Institute, Adelaide, South Australia.
- February 22 through 25. INTERNATIONAL SYMPOSIUM ON MINING RESEARCH sponsored by the U. S. Bureau of Mines and Missouri School of Mines and Metallurgy, Rolla, Missouri.
- February 26 through March 2. Annual meeting of the AIME. Ambassador and Chase-Park Plaza hotels, St. Louis, Ambassador Missouri.
- April and May, Seventh COMMONWEALTH MINING AND METALLURGICAL CONGRESS. Opening on April 10 in Johannesburg with four week tours in the Union of South Africa and one week each in Northern and Southern Rhodesia.
- April 12 through 14. Symposium on AGGLOMERATION, sponsored by the AIME. Sheraton Hotel, Philadelphia, Pennsyl-

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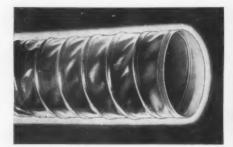
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INTERNATIONAL-

BOLIVIA-Corporacion Minera Bolivia continues its labor-management difficulties, with armed raids and atrocities occurring more and more frequently.

A workers' congress recently vetoed all measures suggested for improving the

PERU - Deposits of phosphate rock, termed "important" have been located by Cia. Minerales Industriales del Peru, S. A. near the town of Sechura in north-western Peru. The deposits reportedly contain high-grade material in quantities large enough to supply all domestic re-quirements as well as some for export.

CHILE—As part of a program to increase production of high grade iron ore at its El Pleito and Dorado mines in Coquimbo province, Compania Minera Santa Fe is purchasing a considerable amount of heavy mining equipment in England. Delivery of 12 Avelin-Bedford dumpers, ten 31-ton Euclid trucks and conveyor system for transporting ore has conveyor system for transporting ore has already been made.

MEXICO—A search for new sources of tin is currently being undertaken by teams of geologists in Mexico. The coun-try now produces about 500 tons of tin annually, mainly from placer operations, and seeks to stabilize the industry and increase production so that at least the do-mestic needs of 1,300 tons annually can be met. Veins from 20 to 30 centimeters wide, containing one kilogram of tin per ton, have already been found in rhyolitic formations in the states of Michoacan, Guerrero, Aguascalientes, San Luis Potosi and Guanajuato. The government teams, however, have set 3 or 4 kilograms per ton as their minimum goal. Mining officials said any promising sites found will probably be turned over to private capi-tal for development. Two tin mills, one in San Luis Potosi and one in Mexico City, are currently in operation.

ARGENTINA — The government has engaged A. Poetter of the Rheinstal firm of Germany to make a study of the tungsten area of San Luis province for the purpose of reducing mining costs in

BOLIVIA-Production figures of Banco Minera de Bolivia for the first quarter of 1960 show increases for tin, copper, lead, tungsten and antimony, but a decrease for gold, probably because of labor difficulties in the Tipuani district. Tin production for the period was 800,303 kilos, 65.81 percent increase; copper totalled 111,895 kilos, a 115.24 percent increase; lead output was 2,795,798 kilos, a 17.19 percent increase; tungsten totalled 71,429 kilos, a 69.26 percent increase; and antimony output was 329,696 kilos, a 1.21 percent increase; tungsten totalled 71,492 from 171 kilos to 144, a decrease of 15.79 percent.

CENTRAL AMERICA - Rich subcentral America — Rich submarine manganese deposits reportedly covering the ocean bottom off the west coast of Central America will be photographed in a project of the U. S. Navy Eeletronics Laboratory of San Diego, California. A deep-sea camera will be used from the survey ship "Explorer" to determine the northern boundary of the deposits. A Russian oceanographic ship reported 80 to 100 percent of the bottom in the area was covered with nodules of manganese, which also had high nickel and cobalt content.

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9-Model 12 Caterpillar Motor Patrols, 8T, 80D, 70, and 71D Series.



-Model LRVX Mack Tractors w/ Nodel LAVA Mack I Factors W/ Model 137W Euclid 30 cu. yd. Bot-tom Dump Trailers powered by NYH-12-BI Cummins Engines; 10— Model PH95AC International Pay-hauler Tractors w/Model PW20 30 cu. yd. Athey Bottom Dump Trailers.



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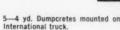


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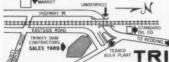


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 1—Kennedy 7' x 9' contin. ball mill
- 1-Allis Chalmers 5' x 5' ball mill, 75 HP
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Index of Advertisers In Mining World

*Asterisk indicates firms whose products are catalogued in MINING WORLD'S 1960 Catalog, Survey & Directory Number

A		
*Acker Drill Company, Inc	81	*K
*Alimak Corporation	8	
*Allis-Chalmers 10,	11	
*Alloy Steel & Metals Co	82	*Le
*American Brattice Cloth Corp	82	
*American Cyonamid Co 18,	19	*Li
*American Maganese Steel Division . 22,	23	
*American Smelting and Refining Co	49	
*American Zinc Sales Co	72	±N
*Atlas Copco	1	*N
_		#N
8	-	N
*Babcock & Wilcox Co 26,	27	
*Baldwin-Lima-Hamilton Corp	24	
*Boyles Bros. Drilling Co	73	#N
*Bunker Hill Co	78	
	76	*R
*Card Iron Works, C. S		
Caterpillar Tractor Co 66, 67		
*Coast Mfg. and Supply Co	78	*5
*Colorado Fuel & Iron Corp	58	#S
p		*5
*Deister Concentrator Co. Inc	73	*5
*Denver Equipment Co Outside Back Co		
*Diesel Energy Corp	63	
*Diesel Energy Corp	63	Т
		*1
#Ellicott Machine Corp	77	
*Euclid Div., General Motors Corp	17	
Account Divis Control Mariety Corp. 1111		*1
G		-
*Gardner-Denver Company	48	*1
*General Motors Corp., Euclid Div	17	*
H		
*Hardinge Company Inc	74	De
*Hughes Tool Co	55	Fe
		M
		M
*Industrial Physics and Electronics Co	77	M
*Inspiration Consolidated Copper Co	72	Pe
*International Harvester Co 12		Pi
*International Nickel Co. Inc	25	R
International Smelting & Refining Co	72	Se
Isotopes Specialties Co	75	Ti
1		W
-	6	W
*Joy Mfg. Co	0	

K	
*Krupp-Rheinhausen	56,
L	
*Lectromelt Furnace Div.,	
McGraw-Edison Co	16
*Lima Div., Baldwin-Lima-Hamilton Corp.	24
KLIMO DIV., Baldwin-Lima-Hamilton Corp.	-
M	
*Magma Copper Co	72
*Marion Power Shovel Co	14
*Mine & Smelter Supply 70,	71
Morse Bros. Machinery Co	47
N	
*Nordberg Mfg. Co	9
De tille to form from John A	21
*Roebling's Sons Corp., John A	21
5	
*Saverman Bros. Inc	80
*Stearns-Roger Mfg. Co	28
*Stoody Company	50
*Sturtevant Mill Company	3
7	
Timken Roller Bearing Co	15
*Traylor Engineering & Mfg. Div	20
W Inside Secret C	
*Western Machinery Co Inside Front Co	2
Wheel Trueing Tool Co	-
*Wilfley and Sons Inc., A. R. Outside Back C	aver
Ounide Bock C	0461
MARKET PLACE	
Darien	. 85
Federal Tank & Pipe	86
Machinery Center Inc	84
Machinery Reserve of Denver	85
Morse Bros. Machinery	84
Perry Equipment	85
Pressey & Son	86
Rouse & Sons, Max	85
Smith, Paul	85
Trinity Dam Contractors	83
Wade, W. R	85
Windeler, George	85

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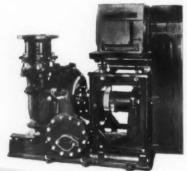




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